Sage on the Stage in the Digital Age: The Role of Online Lecture in Distance Learning

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Abstract: The Internet can be a useful tool that can enhance interactivity in classes. Accordingly, offering distance learning courses using the Web, especially in the asynchronous mode for the additional flexibility of time, is becoming an established practice in higher education. Web-based distance learning comes with numerous benefits, but not without worries for potential deficiencies. One such deficiency in the current distance learning framework is the lack of lecture, the most relied-upon and proven means of instruction in the traditional classroom settings. This paper raises an issue of the lack of lectures in Web-based distance learning, and proposes that streaming video take the role of online lecture in that setting. Described in this paper are the rationale to put the lecture back into e-learning in higher education, two case studies in which the steps were taken to implement the proposed method, and the feedback from the students who took such courses in the undergraduate business curriculum and the MBA program.

Keywords: Web-based education, Asynchronous learning, e-Learning in Higher Education, Sage on the Stage, Guide on the Side, Online Lecture

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1. Introduction

The supportive role of information technology in higher education is a well-established concept. Before the advent of the Internet, numerous studies were undertaken to ascertain the positive impact of instructional information technologies such as electronic classrooms (Leidner & Jarvenpaa, 1993), group decision support systems or GDSS (Alavi, 1994; Briggs, Ramesh, Romano & Latimer, 1994), and a collaborative inter-school electronic linkage (Alavi, Yoo & Vogel, 1997), which can be viewed as a precursor to the Web-based distance learning environment.

Educators today can take advantage of the Internet, especially the Web, to enhance interactivity of courses. Provision of robust network infrastructure is a prerequisite to this new excitement, but such requirement is often readily satisfied in most developed regions of the world. In the context of education, Plous (2000) points out that the Web is convenient, time-saving, suitable for assignments, appealing to students, and able to reach larger audience. Accordingly, offering distance learning courses using the Web is becoming an established practice in higher education, which is literally a global phenomenon. (See Academic Conferences International, 2004, for the diverse geographical representation as well as the commonality of e-learning issues.)

Along with the ubiquity of the Web and its applications in learning, there has been a steep growth of interest in designing and deploying distance learning courses in universities and colleges in various disciplines (Cody, 1999), with increasing degrees of sophistication over time (Reisman, Dear & Edge, 2001). The Web-based distance learning comes with numerous benefits, but not without worries for potential deficiencies in learning. One such deficiency in the current distance learning framework is the lack of lecture, the most relied-upon and proven means to teaching in classrooms in the traditional face-to-face learning.

This paper raises an issue of the lack of lecture in Web-based distance learning courses, and proposes that streaming video take the role of lecture in distance learning, which can be produced from lecture slides of presentation software such as Microsoft PowerPoint. Described in this paper is the rationale to put the lecture back into distance learning, the steps taken to implement the proposed approach, and the feedback from the students who took Web-based courses in the undergraduate business curriculum.
and in the MBA level at Villanova University.

2. Background

It must be noted that distance learning is not a new phenomenon that came into being as a result of recent progress in network technologies and the advent of the Internet. As early as 1980s, synchronous distance learning courses were offered in universities (such as Rensselaer Polytechnic Institute, Troy, New York) to geographically dispersed and distant off-campus students via real-time satellite communication. In addition to seats for students and the podium and chalkboard for the instructor, the classrooms were equipped with cameras and microphones, and a recording and broadcasting system that could be found in typical TV studios. Monitors were also embedded in the lectern for the instructor to view and interact with the students in remote sites. Likewise, each of the remote sites was equipped with a TV monitor and a camera capable of communicating in real time with the broadcasting system in the classroom where the instructor and in-class students were having a class. The scene resembled today’s teleconferencing.

Such synchronous distance learning infrastructure was not widespread due to the prohibitive cost of installation and maintenance of the technology. The platform for distance learning today is drastically different from what is described above. Distance learning courses usually use the Web as the medium, and therefore Web site design and management becomes a necessary component of course development. There are various commercially available distance learning platforms (e.g., WebCT and Blackboard) that can save the instructor's time and energy. They come with standard support features such as course content organizer, on-line quiz, text-based synchronous discussion (or chat), collaborative on-line calendar, threaded discussion board, and the like. To be more appealing to the instructors, publishers of popular textbooks even create (and sometimes host) the course content by providing the ‘Webified’ version of the textbook, which can be made available on the course Web site or linked to it. However, the most crucial enabling factor for today's distance learning is the widespread penetration of the Internet (the Web, to be more specific), and the most pronounced difference between the pro-Internet and post-Internet distance learning is that, for the most part, now learning can take place asynchronously. The implication is immense in that not only the barrier of space (distance learning) but also that of time (asynchronous) has been eliminated.

The disciplines that offer Web-based distance learning courses can be found practically all over college campuses, ranging from business (e.g., Goodwin, Graham & Scarborough, 2001; DeLacey and Leonard, 2002) to education (e.g., Hunt, 1998; Moallem, 2001) to nursing (e.g., Irons, Jung & Keel, 2002). Many ‘success stories’ can be named that reported various successful features of their distance learning courses, such as threaded discussion board (Lawson, 2000; Ellenchild Pinch & Graves, 2000) and collaborative projects (Matthews, 1999; Pychyl, Clarke & Abarbanel, 1999).

Although the Web is an excellent vehicle to convey data in various forms, it has been found that the Web is not necessarily a good replacement of printed content when it comes to textual data. Hypermedia, the technology behind the point-and-click user interface to access difference Web content, has become a target of controversy due to the possibility that it can support different beliefs about its role in learning. On the one hand, the Web can be viewed as a superior medium of learning to the traditional, rigid, printed form. On the other hand, the unstructured and fluid nature of the Web can support a view that it can be an inhibitor to learning, which was not a concern when the materials were presented only in the printed form. One of the findings of Everland and Dunwoody (2001) is that learning, measured by recognition of the organization and structure of the presented information, from printed materials is better than learning from the linear and non-linear information presented in Web pages. The implication is that the Web-based distance learning might be better off by leaving the reading assignment to the textbook rather than converting the textbook to HTML documents.
3. Rationale for distance learning lecture

Although many reports pride their successes in Web-based distance learning, it is not for everyone. Certain courses do not lend themselves easily to distance learning, having to be ‘taught’ only in the face-to-face mode. They are the ones that need the ‘teachings’ of the ‘sage on the stage’ or the ones where learning takes place by ‘observation over the shoulder,’ or the ones where acquisition of certain physical, motor, and voice skills by supervised practices is a critical part of learning, or the ones that involve hands-on laboratory works. In other words, courses like drama, water color painting, or chemistry labs would pose a challenge if offered as Web-based distance learning courses.

A related issue about Web-based distance learning is the potential, and apparent to a certain degree, lack of lecture. Bourne (1998) divides the content of Web-based learning (or Net-Learning, according to his terminology) into two components: 50% self-learning and 50% learning with others. The self-learning component again is made up of on-line materials (e.g., reading, browsing, and taking tests) and computer-based training (e.g., simulation, visualization, and data access). The component of learning with others is comprised of on-line conferencing (e.g., electronic mail, listservs, and threaded discussion) and synchronous interactions (e.g., on-line chat and telephone conversations). Surprisingly, there is no mention of ‘lecture’ in the context of Web-based distance learning.

Similar views are shared by a number of ‘theorists’ and ‘experts’ of learning. It seems that, according to these opinions, learning can happen primarily by the effort of students while the teaching function of the instructor stops at developing Web-based course materials, and only to point where to look, and testing if the students ‘got it.’ (For a typical set of roles of instructors in student-centered teaching, see Motschnig-Pitrik & Holzinger, 2002, p.165.) They argue that the traditional role of face-to-face lectures is a thing of the past, when today’s technology was unavailable, and that the new mode of learning has emerged where the teacher is like a coach who facilitates mutual learning and participates in the process of discovery of knowledge (Wildman, 1998; Langford & Hardin, 1999).

While the traditional mode of teaching is sometimes referred to as the ‘sage on the stage’ method with a slightly negative connotation in that circle, lecturing is an indispensable part of teaching in most undergraduate courses whether they are offered as a traditional classroom course or as a Web-based distance learning course. The view described above, in which lecture is regarded as a thing of the past, is often called the ‘guide on the side’ approach, and may be applicable only to some high-level graduate courses where discovery or synthesis of new concepts is the primary goal. This reasoning is supported by the fact that they tend to refer to the students as adult learners.

Another plausible explanation of such a defensive posture of ‘not including lecture’ in the Web-based distance learning courses might simply be the difficulty of delivering lectures over the Internet, which is a medium of communication for digital contents. In fact, it is impossible to deliver as good a lecture in the distance learning mode as in classrooms where teaching and learning takes place in real time and in the fully interactive mode. No distance learning platforms today provide a vehicle to deliver a classroom-like lecture except text-based chats. While a few best-seller textbooks come with the Web content comparable to the textbook, such provision is not only a luxury available only to limited courses but also is far from being sufficient to replace the lecture of the instructor no matter how much of the pre-packaged Web content is customizable. Therefore, if lecture is to be included in a Web-based distance learning course, the instructor will have to provide more than what is currently available on the Web, on the commercial platforms, and on the campus network servers.

4. A potential solution for reclaiming lecture in distance learning

PowerPoint slides are used in a growing number of courses as a vehicle to deliver lectures. While the efficacy of PowerPoint slides for student performance is inconclusive (Szabo & Hastings, 2000), if made available in advance, they can help...
students take notes during the lecture instead of copying the contents of the slides. The utility of PowerPoint slides goes farther in distance learning environment. A good portion of distance learning courses use PowerPoint slides, which serve practically as a replacement of lecture. Easily transported via the Internet and with the popularity of the software, PowerPoint files are becoming the mode of content delivery for e-learning. However, since the slides are merely teaching aids but not meant to substitute the lecture, instructors of distance learning courses try to make up for the missing lecture in various ways, such as annotating the slides as much as possible or including the lecture scripts as part of the file.

Adopting simple multimedia authoring software such as RealPresenter®—or its subsequent evolutions (e.g., PresenterONE®) and its competitions (e.g., Macromedia’s PowerPRESENTER® that produces flash content out of PowerPoint slides)—in Web-based distance learning courses seems to shed light on the feasibility of taking this trend a step further by turning still PowerPoint slides into a streaming video. (See Tiedemann, 2002, for alternatives.) This involves a fairly simple procedure of recording and mixing the sound of lecture with the slides (loosely termed voice-over). This can be a fine emulation of a classroom lecture applicable to a distance learning course, in which the lecture can be equated to the explanations of the slides for the most part, although the mode of lecture is still not fully interactive.

However, there are courses like an introductory undergraduate information systems (IS) course where there are other elements in the lecture than explaining the content of slides. For instance, after a certain concept has been introduced (e.g., role of software in managerial decision making), students learn how to apply the introduced concept using software (e.g., spreadsheet modeling in Excel, querying a database using Access, or programming in Visual Basic). Therefore, demonstration of software application is often an essential part of the lecture, and switching between the lecture slides and the software demonstration is commonplace. In addition, it is often necessary to write on the board impromptu in order to work on additional examples. Figure 1 shows a typical lecture scene of such courses. Explanation using voice is the dominant part of the lecture, and is denoted by 1. The ceiling-mounted projection unit is used to show the slides (2) and software demonstration (3). Since there is only one projection unit and one projection screen in a typical classroom, they need to be alternated during the lecture. Denoted by 4 is the writing on the board for additional discussion topics that is not part of the prepared slides.

Figure 1: Lecture components of a typical introductory information systems course

5. Distance learning without lecture

From the students’ point of view, the above four lecture components are only a part of a larger learning process. Shown below is a simple chart (Figure 2) depicting what activities should take place before, during, and after the class, in the traditional classroom setting. Without a proper mechanism to compensate the missing lectures, distance learning classes could result in serious compromise. More specifically, if distance classes were to use PowerPoint slides only, but without lecture, the following misgivings are expected.

Figure 2: Activities in traditional class learning

As shown in Figure 3, the primary deficiencies indicate the direct effect of inadequate lecture (or no lecture at all, other than providing slides) in a distance learning class, while the secondary deficiencies are the ripple effects resulting...
from the primary deficiencies. Both types of deficiencies are inevitable unless the class meets in the regular classroom (i.e., face-to-face) and takes the burden of making up for what should have been done in the distance classes.

Figure 3: Potential deficiencies in a distance learning class without lecture

6. Implementation of distance learning lectures

The Business School at Villanova University decided to offer a small number of distance learning sections from each discipline. It was also decided that such distance learning sections were to be offered as a mixture of face-to-face and online classes, so-called ‘50/50 DL.’ The campus-wide distance learning platform was WebCT, which was used for organizing course materials (e.g., syllabus, lecture slides, additional reading materials, etc.), communications (e.g., chat, threaded discussion, etc.), and evaluations (quizzes and exams). Since WebCT was synchronized with the Registrar’s database of courses and students, the instructor’s extra burden to manage student records was fairly light. Another added benefit of using WebCT was that it created a password-protected environment. Therefore, only the students who were officially enrolled in the course could access the particular distance learning section’s Web site. By virtue of being a Web-based platform, WebCT was accessible from both on-campus locations through local area networks and off-campus locations through students’ own ISPs.

Production of streaming video lecture was done with RealPresenter®, a multimedia authoring software package, whose primary function was to turn PowerPoint slides into voice-over streaming video content. In addition, a low-end PC video camera was also used to capture any other live images. With this fairly inexpensive setup, the voiced-over online lectures (for 1 and 2 in Figure 1) integrated with computer “screens shots” (for 3) and ordinary video (for 4) could be produced. By designing and delivering lectures this way, distance learning classes could emulate much of in-class lectures, while maintaining the benefits of the online distance learning format—i.e., remote and asynchronous access to lectures—along with the ability to “replay” the lectures.

In implementing distance learning with lecture, three physically separate servers were used. The first server housed WebCT and its contents, available only to those who were enrolled in the distance learning sections. The second one was a general Web server, open to the public, holding the course syllabus, announcements, and lecture slides. Typically, students downloaded the lecture slide files a few days before class whether they were distance learning or regular in-class students. Finally, the third server was equipped with the RMServer® operating system, which was necessary for streaming the lecture content (in the form of so-called Real media) to the student’s computer either via the Internet (for off-campus) or through the campus LAN.
6.1 Case Study I

Two sections of the introductory information systems course were selected to be offered as 50/50 DL. The classes met face-to-face in the classroom every other week, and when they did not meet in the classroom, they ‘met’ on-line in “DL” weeks. On-line lectures were recorded over the weekend before the distance week, and uploaded using FTP from the instructor’s computer to the RMServer server. During the distance week, students were expected to download the lecture slides, play (or view, listen to) the lecture, and take a quiz which was based on the lecture materials of the distance week. During the distance week, office hours were held on-line using the ‘chat’ facility of WebCT. Often times, students were “sent” to breakout chat rooms to meet in small groups and come up with answers to the discussion questions.

A survey instrument consisting of ten questions (See Table 1.) was developed to evaluate the efficacy of the streaming lectures for distance learning. The first nine questions were in the form of a statement, and the students were asked to specify the extent to which they agreed with them. The last one was an open-ended question asking for suggestions for improvement. Two weeks prior to the end of the semester, the survey was taken via the anonymous on-line survey facility available on WebCT. In short, the survey was intended to measure the benefits of the 50/50 DL approach from the perspective of the students.

Table 1: Case Study I - Survey questions

<table>
<thead>
<tr>
<th>Question</th>
<th>Section 01</th>
<th>Section 02</th>
</tr>
</thead>
<tbody>
<tr>
<td>This course is my first experience in distance learning.</td>
<td>27 (4.48, 1.31)</td>
<td>28 (4.04, 1.71)</td>
</tr>
<tr>
<td>Due to the lack of actual contacts, the distance learning classes are less effective than face-to-face classes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexibility of schedule is the most significant attraction of distance classes.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I tend to procrastinate with the distance learning classes since I can catch up with the missed class later when I have more time.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-scale distance learning (rather than 50/50) can work well during regular semesters.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In a distance learning week, reading the textbook and viewing PowerPoint slides alone (without streaming video lectures) does not make me learn much.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Listening to streaming video lectures that are longer than 50 minutes reduces effectiveness.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I want the streaming video lectures available for both regular and distance classes so I can review the lecture materials later.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unless different distance classes were scheduled back-to-back, isolated distance classes do not add much to my schedule convenience.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Please comment on the distance learning format, streaming video lectures, and this course in general.</td>
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</table>

Question (A) could simply be answered either by ‘True’ or ‘False,’ but used the same answer categories as in Questions (B) through (I), for which students were asked to select one of the follow alternatives:
- Strongly disagree [SD]
- Disagree [D]
- Neutral [N]
- Agree [A]
- Strongly agree [SA]

The survey result from the two sections of 50/50 DL classes is summarized as Table 2. From the answers to Question (A), it was clear that distance learning was a new experience to the majority of students. (Forty-four out of fifty-five respondents said this was their first distance course.) Regarding the comparative effectiveness between distance learning and face-to-face classes, 20% of the students felt that distance learning classes were less effective than face-to-face classes. Three students strongly agreed, and eight agreed with the statement, “Due to the lack of actual contacts, the distance learning classes are less effective than face-to-face classes.”

Table 2. Case Study I - Summary of result

<table>
<thead>
<tr>
<th>Question</th>
<th>Section 01</th>
<th>Section 02</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td>27 (4.48, 1.31)</td>
<td>28 (4.04, 1.71)</td>
</tr>
<tr>
<td>(B)</td>
<td>27 (2.33, 1.04)</td>
<td>28 (2.7, 1.12)</td>
</tr>
</tbody>
</table>
Students had been informed of the format (50/50 DL) of the sections they were enrolled in, and the next question was intended to see how true it was that they took the distance learning section of the course to enjoy time flexibility, which was a common answer obtained in informal conversations in the hallways. The survey result confirms that flexibility was the biggest attraction to distance learning. By common sense we can hypothesize that time flexibility could develop a tendency to procrastinate, and the next question was to gauge how distance learning affects the student’s behavior in time management. Opinions about distance learning being a source of potential procrastination were fairly evenly distributed. The next question, “Full scale distance learning, rather than 50%, can work well during regular semesters,” was to asked because some 100% distance learning courses were offered during the summer session, and was to test out the feasibility of such distance learning format in undergraduate courses during the spring or fall semesters. The survey finds that most students felt that full-scale distance learning may not work outside the summer session, at least from the undergraduate students’ perspectives. The next was the very question designed to verify the validity of the idea that lecture is indispensable even in distance learning courses: “In a distance week, reading the textbook and viewing PowerPoint slides alone (without the streaming video lecture) does not make me learn much.” More students disagreed with the statement than agreed. This can be rephrased as “Without the on-line lecture during the distance week, I can learn as much,” and can be possibly interpreted as a rejection to the working hypothesis of the current project. However, with the last question of open-ended comments and suggestions, it became clear that it did not indicate the reverse of the necessity of on-line lectures for distance learning. Unlike what the number says (means 2.89 and 2.54 out of 5 with standard deviations of 1.09 and 1.26), twenty-eight students (out of fifty-five) indicated in their comments that the on-line lectures in distance weeks were as effective as, or sometimes even more effective than, in-class lectures. They named a few common reasons as below:

- Ability to pace oneself listening to the lecture
- Ability to replay parts of the lecture
- Finding the most effective time to listen to the lecture for better concentration

Here are a few representative comments from those twenty-eight students, supporting the on-line lecture idea:

“I find the streaming video lectures very helpful, and I would not learn as much without them.” — Student #8, Section 1

“I like distance learning a lot, but it definitely needs some kind of online lecture to make it worthwhile.” — Student #13, Section 1

“Personally I feel that with the streaming videos and powerpoint slides, the distance portion of the course was just as effective, if not more effective, than the weeks in class.” — Student #17, Section 1

“I found that I benefited very much from the online
lectures. It made studying so much easier and the examples helped me to understand the information better. I noticed a big difference between taking the test after listening to it and after not listening to it. I think that should be stressed more." — Student #19, Section 1

“I wouldn’t have learned as much from the distance classes without the streaming video lectures.” — Student #6, Section 2

“The streaming video lectures were as effective, if not more than face-to-face because you could replay them to review the material.” — Student #15, Section 2

On the other hand, there were voices quite critical about distance learning lectures. Six out of the fifty-five students showed their disappointment toward distance learning lectures. The two main reasons for their disapproval were:

- Web congestion while the lecture was being accessed from an off-campus location
- Preference to the more natural, face-to-face, interactive environment

Here are the comments from the six students:

“The streaming video lectures are difficult to access off camps considering some of us do not have the fastest internet connections. Often the lectures would cause the internet connection to be lost. Then the entire lecture needed to be listened to all over.” — Student #3, Section 2

“It’s easier to miss something from a streaming video lecture than from an in class lecture.” — Student #10, Section 2

“[The professor] is a great teacher, so I think the distance learning hurts this course because it takes away the time from [the professor] in the classroom.” — Student #19, Section 2

“Sometimes I felt that I had not enough interaction with the class. It is the ‘modern’ way to of doing things, but I am not quite sure it is better.” — Student #20, Section 2

“I enjoyed the convenience to my schedule but, personally, I learn better in a face-to-face environment.” — Student #25, Section 2

“I do feel that a lack of face-to-face contact does make learning the material more difficult.” — Student #26, Section 2

As for the remaining three questions, which were meant to probe the student preference about certain aspects of distance learning lectures, it was found that the majority of students felt that online lecture kept under 50 minutes would be preferable to longer lectures, and that most students desired to have an access to the online lectures in the archive whether they were from a distance lecture or in-class lecture, and that coordination of distance courses (so that distance learning courses are scheduled consecutively to maximize scheduling convenience) was not particularly desired. The students’ opinion advocating lecture archives speaks volume for the positive aspect of the digital medium, which lends itself to convenient storage and retrieval using the network.

6.2 Case Study II

Along with the maturity of distance learning technology and practice on campus, an opportunity was arose to offer Telecommunications, an advanced information systems topic, as 100% online courses at undergraduate and MBA levels during the same semester. (Prior to that time, the course had been offered as 50/50 DL.) Although they were designated as “100% DL,” the first and the last classes of the semester were to meet face-to-face. The technology, infrastructure, online lectures, online quizzes and exams, number and frequency of homework assignments, etc. remained the same as 50/50 DL. The size of the undergraduate class was 14, and the size of the MBA class was 24. All 14
undergraduate students were physically on campus throughout the semester. However, the majority of the MBA students were full-time employees, taking classes in the evening.

By design, evening MBA students can take only one class on a given day, and therefore, the number of courses they take in a semester usually determines the number of commutes to campus per week. Since the MBA students tend to juggle multiple objectives and responsibilities—career, graduate degree, family, etc.—any opportunity to reduce the number of commutes to campus seems considered a plus. In that particular semester, a number of students in the MBA class were traveling extensively, and one student in particular was literally taking a distance course, from over seven hours’ driving distance away in a different state.

As done before, a survey was administered toward the end of the semester, with the questions listed in Table 3. Unlike the questions shown in Table 1 (for 50/50 DL), there were nine questions. The first six questions required responses on a 7-point Likert scale—‘1’ being “Strongly Disagree”, ‘4’ “Neutral”, and ‘7’ “Strongly agree”—plus one more possible choice of “Not applicable” or “Cannot answer.” The remaining three questions were open-ended.

Findings from Case Study II are presented below. The summary is geared to comparing the responses of the undergraduate students to those of MBA students. Instead of aggregating the data, the full detail of the response frequencies is presented.

Table 3. Case Study II – Survey questions

<table>
<thead>
<tr>
<th>Question</th>
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<tbody>
<tr>
<td>(A) Compared to other distance learning courses without online lecture, this course offers better learning opportunity because of the lecture component.</td>
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<tr>
<td>(B) Weekly synchronous chat sessions are effective.</td>
</tr>
<tr>
<td>(C) Weekly synchronous chat sessions are desired.</td>
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<tr>
<td>(D) If the technology were available, I would prefer voice chat to text chat.</td>
</tr>
<tr>
<td>(E) It is better to eliminate weekly quizzes for the sake of flexibility of time.</td>
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<tr>
<td>(F) Posting the chat log every week is helpful.</td>
</tr>
<tr>
<td>(G) What do you think is an appropriate length of each online lecture?</td>
</tr>
<tr>
<td>(H) What are your opinions on distance learning in general?</td>
</tr>
<tr>
<td>(I) What are your opinions on this particular distance learning course? Provide comments for improvement.</td>
</tr>
</tbody>
</table>

For Question (A), which sought to ascertain the necessity of online lectures, both undergraduate and MBA students showed positive attitude toward online lecture. Of the 14 undergraduate students, only five took other distance learning courses. None of them viewed the lack of online lectures favorably. The MBA students exhibited a wider range of opinions. Two thirds of the MBA students had taken some other distance learning courses. Although there was a predominant support for online lecture, 25% of MBA students found the lack of lecture in distance learning to be not so objectionable. This observation is summarized as Figure 4.

Figure 4: Efficacy of online lectures in distance learning
Both undergraduate and MBA classes were rather indifferent or negative about the effectiveness of the synchronous element of the distance learning. As shown in Figures 5 and 6, more students seemed to be uncommitted to an opinion as to the effectiveness of online chat sessions, but clearly against the practice of having regular chat sessions. This strong resistance to online chat is an indication of the students’ desire for the freedom from regularity so that they could maximize time flexibility. Since these were 100% distance learning courses, it could have been almost “self-paced” learning had the regular (i.e., weekly) synchronous sessions been eliminated. As for the preference of voice chat to text chat, no clear pattern was visible.

The next question—Is it better to eliminate weekly quizzes for the sake of additional flexibility of time?—was to gauge how much time flexibility was desired. This item is somewhat different from the previous issue of the desirability of chat sessions. Chat was the only element of real-time communication requiring physical presence (regardless of actual locations) of the whole class (thus synchronous). Weekly quizzes, however, were much less stringent in terms of synchronicity and regularity, since they were designed primarily to serve as a safeguard against procrastination as students were allowed to listen to the lecture practically any time of the week they chose.

The responses show that, contrary to the desire to break away from the rigidity of synchronous requirements (i.e., the chat sessions), the majority of students, both the undergraduate and MBA, wanted to keep weekly quizzes, which they saw as a “pacemaker” to keep the regularity of the distance learning mechanism. As Figure 7 indicates, there is a hint of skewed bimodality in both responses. That is, much less students are found in the middle than those at the extremes who have strong opinions. An overwhelming majority was against the idea of eliminating weekly quizzes, and approximately 14% of the undergraduate and 25% of the MBA class strongly supported eliminating weekly quizzes. The follow-up correspondence revealed that...
the desire to keep the weekly quizzes stemmed from the fear of procrastination, which was precisely the suspicion that had led to pose the question.

Error!

Undergraduate

<table>
<thead>
<tr>
<th>Answer</th>
<th>Value</th>
<th>Frequency Distribution</th>
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<td>3</td>
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<td>2</td>
<td>0%</td>
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<tr>
<td>7</td>
<td>0%</td>
<td>2</td>
</tr>
</tbody>
</table>

**Figure 7: Desirability of eliminating weekly quiz**

As for the opinions about the effectiveness of chat logs, virtually no one disagreed. With regard to the opinions about the appropriate length of online lectures, which was asked as an open-ended question, a similar pattern is observed between the two groups. The raw data is shown in Figure 8, but the responses can be re-grouped into three categories, i.e., (i) 30 minutes or less, (ii) between 30 and 45 minutes, and (iii) 45 to 60 minutes.

Undergraduate

<table>
<thead>
<tr>
<th>Response</th>
<th>Value</th>
<th>Frequency Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>0%</td>
<td>6</td>
</tr>
<tr>
<td>30</td>
<td>0%</td>
<td>2</td>
</tr>
<tr>
<td>30-45</td>
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<td>1</td>
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<tr>
<td>45-60</td>
<td>0%</td>
<td>1</td>
</tr>
<tr>
<td>50</td>
<td>0%</td>
<td>3</td>
</tr>
<tr>
<td>50-60</td>
<td>0%</td>
<td>1</td>
</tr>
</tbody>
</table>

**Figure 8: Length of online lecture**

The undergraduate students’ responses can be summarized as: (i) 14% supported 30 minutes, (ii) 7% for 30-45 minutes, and (iii) 79% for 45-60 minutes. The MBA students responded: (i) 25% supporting 30 minutes or less, (ii) 8% for 30-45 minutes, and (iii) 67% for 45-60 minutes. Interestingly, one hour was the ceiling for the length of online lectures in both groups. This finding suggests that it would be wise to break up long lectures into a few smaller segments so that a needed level of concentration can be maintained.

The remaining two questions were also open-ended, soliciting comments about distance learning in general—Question (I)—and about the current course in particular—Question (J). Responses reveal a tendency of reservation towards distance learning in general, and specifically toward the distance learning courses without online lectures. This tendency stands out among the responses from the undergraduate students, while the MBA students who take evening classes seem to find distance learning a relief mechanism from their busy schedule. The following remarks represent the student feedback about distance learning in general.

“I feel that the online lectures and the chats were very important for the course, and...”
I would never want to take a distance learning class that did not include these components." — Student #2, Undergraduate

“I think there should be some kind of tuition discount for taking distance courses. And as they become more popular, a limit on the number each student can take.” — Student #5, Undergraduate

“For undergraduate work it is not a good idea.” — Student #6, Undergraduate

“I am not a huge fan of distance learning classes.” — Student #8, Undergraduate

“To someone who is working full-time and balancing other demands, I find the added flexibility DL offers is a big plus.” — Student #1, MBA

“The more asynchronous the better the DL class.” — Student #10, MBA

“Student only gets out of the class what he or she puts into the class. If Villanova is going to establish itself as a higher tier MBA program, it must be careful how it approaches distance learning. I don't want Villanova's MBA program to be associated with some 'mail-order degree' program because of its strategy regarding distance learning.” — Student #14, MBA

The following sample represents the students' opinions about the current course. The positive nature of the feedback is by and large attributed to the online lecture.

“This was the first distance learning class I ever took. And while I did learn much of the material, I felt like I would have learned more if I had to go to a class every week.” — Student #4, Undergraduate

“I really enjoyed this course, and liked the flexibility of completing things on my own time. This course would not work well with all professors, but your weekly sessions were focused and helpful.” — Student #9, Undergraduate

“This course was a perfect example of what a distance course should be like.” — Student #14, MBA

“I have had several distance learning courses at this point, and this one was far and away the best, meaning I learned more in this distance learning class than any of the others.” — Student #16, MBA

“I felt that the recorded lectures were extremely helpful in making sure that I was really understanding the material. I've had 50%/50% classes in which we did not have the online lectures just chats instead and I felt that I was forced to learn on my own in those situations.” — Student #21, MBA

Obviously these comments reinforce the original claim of this paper that online lecture should be considered an indispensable part of distance learning courses.

7. Summary and conclusion

The key point of this paper was to suggest that Web-based distance learning courses without the lecture component diminishes the various benefits of asynchronous distance learning. It first provided a cursory review of the current state of distance learning in the current higher education settings, and then presented two competing views about the role of instructors in distance learning: the 'sage on the stage' versus the 'guide on the side.'

The remainder of the paper described two cases of Villanova experience that involved designing and implementing distance learning courses. The reasoning behind the argument for the indispensability of lectures in distance learning was presented first. Then, the details of the two case studies were presented—the courses, delivery format of instruction which included the online lectures, student surveys, and the summary of the feedback from the students.
In conclusion, Web-based distance learning courses will benefit from providing the students with on-line lectures using multimedia contents such as streaming video. According to the findings from the cases at Villanova University, a good majority of those who took distance learning courses indicated that a distance learning course without on-line lecture would compromise learning. Again, that was the main point of this paper.

References


Abstract: This paper will introduce a master program in ICT and Learning (MIL) and present some of the experiences we have gained so far. MIL is a result of a collaborative initiative taken by five Danish universities, and it is an accredited part-time 2-year master program. It is unique in the sense that it builds on the pedagogical framework of project pedagogy and is based on online collaboration.

The paper will describe MIL, the universities involved, the administrative organization, and the profile of the students. We will discuss the pedagogical framework and the project collaboration in relation to the modularity and flexibility that characterize the study and allow admission of part-time students, full-time students and students who only sign up for one accredited module. The methodology will be illustrated through empirical snapshots from selected modules in the start-up phase, and the focus will be directed towards problems experienced by the students. From an analytical perspective, the paper will identify and discuss fundamental problems related to the organization, flexibility, and implementation of project pedagogy online.

MIL is organized around ICT and Learning and the study theme focuses on ICT and Learning. In addition, MIL provides a learning space where practice is under constant negotiation and reconstruction as an inherent, integrated part of the learning process. Consequently, we argue that MIL may be seen as an example of best practice in blended learning.

Keywords: Virtual learning, mixed mode, project pedagogy, student profile, methodology.

1. MIL – a Danish master program on ICT and Learning

In Denmark, master degrees were established in the late nineties, partly as a result of a European initiative to coordinate and create correspondence between university study programs, and partly as an attempt to enhance cooperation between universities and business to provide people with an opportunity to pursue continued education and develop competencies in a knowledge-based society.

A national initiative was taken to secure continued education within information technology: 1) a new IT University was built in Copenhagen and 2) a networked IT university was established building on the existing universities in the western part of Denmark in 2000 (figure 1).

Although the political decision resulted in two regional IT universities, the master program in ICT and Learning (MIL) ignored this national division and established collaborative bridges between five Danish Universities: Aalborg University, Aarhus University, Roskilde University Center, Copenhagen Business School and the Danish University of Education in Copenhagen. The research communities have contributed with different but complementary competencies and form a unique background for the master degree in ICT and Learning. Thus, MIL has been established as a national master degree under the auspices of the IT University West, but also in cooperation
with three universities outside the IT University West (fig 1).

Figure 1: The dotted line shows the division of Denmark between the IT University West and the IT University of Copenhagen. The map also shows the geographical location of universities in Denmark. The universities written in italics are partners in MIL.

MIL was established for a four-year experience period. Based on the positive experiences from the first period, the Ministry of Science and Technology extended the cooperation for an additional four years. The administration and the legal protection is located at Aalborg University, but the responsibility for developing and running the curriculum is placed in a steering committee with representatives from the five universities involved.

MIL may be viewed as a forerunner of the virtual university concept in Denmark. The first challenge was to build the organizational collaborative framework, which turned out to be a major challenge. MIL was placed “in the middle of nowhere” without any relations to existing legal, financial or administrative systems. A steering committee constituted by senior researchers from the five universities was established. The researchers had a long tradition for cooperating on research in ICT and Learning and a common language related to the research area. Thus, they already constituted a research community with a holistic and coherent foundation for designing the MIL master program.

2. Profile of the students
MIL aims to offer educational opportunities to people working in the public and/or
private sector. We think of the potential students as teachers, publishers, project or human resource managers, etc.

Since the program started in 2000, we have had 209 students. 60% of the students came from the public sector and the rest from the private sector. The fact that the course fee for attending MIL is generally lower than for master degrees addressing the private sector more directly may account for the high number of students from the public sector. Approx. 50 % of the students’ basic competencies related to education, and approx. 25% of the students had high level skills related to IT. Nearly all the students had a leadership background in organization or in various projects.

Apart from the challenge of making five universities’ organizations collaborate, the wide gap in competencies was one of the basic problems in planning the curriculum. An interdisciplinary master program may attract students with expert knowledge of IT, but only little knowledge of learning, students with a general knowledge of both learning and IT, or students with a learning background, but only little knowledge of IT. Besides, some students returned to school for the first time after spending more than ten years working. The curriculum had to capture all these profiles in addition to diversity in age and study culture. In other words, it had to support the development of “reflective practitioners”(Schön 1987).

The drop out rate has been close to 25%, the main reasons being work pressure (most of the students study part-time combined with full-time jobs) and the high number of on-line activities. Typically, the students do not study to make an academic career. They are very engaged in their professional work, and advancement within their organization or getting a new job are the main factors in their motivation for studying. From our evaluations, we know that dropping out also is related to the students' equal ambitions in terms of both studies and work.

Participating in a master degree program on ICT and Learning with the use of ICT calls for a different kind of engagement from the students. They bring actual problems from their professional life and organizations into the study and collaborate with fellow students working on similar problems. The context of the study transforms them into a group of experienced practitioners in a shared reflective endeavor.

3. Study program
To plan a curriculum for students with full or part-time work from different parts of the country requires a focus on flexibility in time and space. In Denmark, a master degree has a value of 60 ECTS (European Credit Transfer System) in a normal year of study. The MIL curriculum is organized as a part-time study covering 30 ECTS annually (part-time).

To secure flexibility, the study program has been developed in mixed mode combining face-to-face seminars and on line activities. It is organized with four seminars of two days’ duration per year of study (two in the eastern part of Denmark and two in the western part of Denmark). In between the seminars, the students collaborate virtually.

As mentioned previously, MIL is based on collaboration between five Danish universities, each of which has brought different study cultures into the master program. Some of the universities have a strong tradition for lecturing, case-based learning and well-defined curricula. Other universities are fundamentally based on the notion of projects and actually identified as project universities. The basic principle in MIL is project learning, which integrates the best from the two cultures in a combination of course modules and projects. The course modules integrate the two cultures in mini projects or case studies to secure the integration of theory and practice (Dirckinck-Holmfeld 2002, Dirckinck-Holmfeld et al. 2004). Only few other programs of similar curricula share this approach (McConnel 2002).

For people with a full-time job in addition to their online studies, a clear structure with well-defined goals for every part of the curriculum is vital. MIL is structured as a modular system divided into smaller courses. Every course module typically contains 2 or 3 sub-courses. It is possible to finish a course in a relatively limited span of time. However, it is a challenge to establish a subtle balance between flexibility in time on the one hand, and to

http://www.ejel.org/  
ISSN 1479-4403
ensure learning, i.e. knowledge acquisition, reflections and integration in practice, on the other.

The modular structure is also a result of many different needs for further and continued education. Basically, the curriculum is planned as a part-time study, but full-time students and students who only sign up for one accredited module are also accepted. It is anticipated that more and more students want to combine modules from different master programs to construct their own “flexible master” curriculum. This vision is supported by the Ministry of Science and Technology.

The basic course modules reflect the epistemology of the curriculum. In the first year, the students attend two basic modules. **ICT based learning processes** covers intra psychological and mediated interpersonal learning processes and learning in communities of practice. **ICT and Interaction Design** focuses on analysis, design, test and evaluation of human-computer interaction. It takes its point of departure in theories on human beings/users and the mental processes. Interaction is understood as taking place in the interface, which is multimodal (text, images, sound, etc.). The two modules form the foundation of a project work within the thematic frame ICT and learning processes: use and meaning.

![Study Program](image)

**Figure 2:** study program

In the second year, the students also attend two basic modules. The main theme of **ICT and organizational learning** is knowledge sharing and knowledge management in the learning organization. The module focuses on intra and inter-organizational learning processes and ICT in communication and continuous learning. **ICT and didactic design** takes its point of departure in pedagogical theories and works with graphics and scenographic design in addition to dramatic and narrative dimensions as a basis for design of virtual learning resources.

Based on the first year of project work and the four course modules, the students write their final master thesis. The master thesis may be theoretical, analytical or based on product development (from prototype to final application). Normally, however, the thesis will include elements from all three dimensions.

### 4. Pedagogical framework

To secure flexibility in relation to time and space, MIL is organized as blended learning with online studies and four annual face-to-face seminars.

The ideology of MIL is based on the notion of “communities of practice” (Wenger 1998), and MIL students come from different enterprises and organizations. From the perspective that learning is an authentic and social process, the study
program is fundamentally based on collaboration in projects. This approach is not only valid for the first year project and the master thesis; it also penetrates the pedagogical thinking behind the four course modules. With this approach, we attempt to facilitate an integration of theory with the students’ work experiences.

In the educational context of MIL, the students are encouraged to use their diversities as sources of inspiration and turn them into strengths in the collaborative work. Furthermore, we encourage students to establish groups across their specific experiences and interests. This is a challenge for both group members and facilitators, as it requires a high degree of awareness and knowledge in the constitution of groups, the organization of groups and the group process.

5. Methodology

In the following, we will present empirical snapshots from MIL. The aim is to give an impression of the work in MIL and highlight some of the problems related to the virtual organization.

The different cultures at the different universities may be illustrated by the two course modules in the first year: ICT based learning processes and ICT and Interaction Design. Both modules take their starting point in introductions and lectures at the first seminar, and the course work continues online. The module on ICT-based learning processes is based on and experiments with the features of collaborative online dialogue, while the module on ICT and interaction design is based on collaboration in groups designing a product online. The difference between the two modules is reflected in the structure of the online forums, the role of the teacher, and the evaluation criteria (Sorensen 2003). Both modules operate with a forum for meta-discussions.

An extensive evaluation carried out in 2003 showed that this difference caused some confusion among the students. When promoting such pedagogical diversity, it is important to communicate the differences and illustrate what we are preaching in practice. But there is also a need for introducing more virtual tools to handle different types of collaboration and more appropriate tools to help students manage their portfolios.

The first project work enhances the students’ competencies in project management. The students learn to carry out the basic planning on face-to-face seminars, use chat to handle specific problems (making decisions etc.), and use asynchronous written forums for collaborative discussions and reflection. In addition, they employ other types of communication software for synchronous communication (visual, audio and text-based).

Pedagogical design is the module involving experiments on learning objects and learning resources. One of the experiments related to the university library where the traditional course book was replaced by an electronic version. In collaboration with the university library, both copyrights and payment for use were negotiated for the experiment. The library uploaded the literature in a resource portal on the web. However, a questionnaire showed that only 35% of the students perceived this as an improvement.

It is important to make the electronic library more attractive to the students. This may be done by implementing added value to the course materials and resources. One of the advantages of web resources is that they may be supplemented with tools for annotations (e.g. guidelines from the teacher, reflections from the students, etc.). At the moment, we are collaborating with a software producer to explore the possibilities of group-based annotations.

Another experiment has been the development of video based course material. MIL has produced resources in the shape of online lectures using streaming videos stored in the course archives. Furthermore, video-based interactive lessons for courses on PhotoShop and Dreamweaver have been developed. Also, the streamed lectures and screen shots have been manipulated into small segments representing a single problem, which can be accessed from a menu and combined with tasks (Fibiger 2003). The responses from the students
are positive, and the exploration of the potentials will continue.¹

In a number of ways, videoconferences are also represented in the curriculum: at face-to-face seminars to include researchers from abroad as guest lecturers and as a tool for specialized activities bridging three regional sites. In our experience, videoconferences require extended preparations related to both the set up and the content. Videoconferences are not tools for presentation, but tools for discussions. Taking these preconditions into account, videoconferences may represent an excellent way to expand the classroom.

6. Studying in virtual environments

MIL has now existed for 4 years and served 200 students. The students have been between 30 and 60 years old, studied on a part-time basis while holding a full-time job, and have had a background in pedagogy or ICT.

The way in which the students interact and collaborate falls into patterns that may be characterized by three profiles: the enthusiast, the main-streamer, and the pragmatist. They differ basically in their relation to information in the virtual learning environment.

The Enthusiasts make up 15 % of the students. They are interested in all items of information and very active in forums on a nice-to-know basis. They are on the web daily, often more than once, and also during the weekends. They read all contributions to the forums in which they participate, and they are very active in meta-forums and social activities on the web.

The pragmatists also make up approx. 15% of the students. The pragmatists go for need-to-know information, and they are only on the web once or twice a week. They focus on the obligatory scientific forums and participate only in debates as part of the curriculum.

The rest of the students: the main streamers make up approx. 60-70%. They are online nearly every day, depending on their need for information and their activities in their private and professional lives. They are involved in the scientific forums and the meta-forums, and from time to time they are active in forums with nice-to-know information.

7. Best practice and pedagogical design

In our experience, virtual learning is not a simple matter. It suggests a diversity of pedagogical approaches. Different scientific disciplines and interdisciplinary approaches call for different learning cultures, which in turn must be seen in relation to several parameters: different students with different aims and with different plans in time and space. Different students with different learning and communication styles, different social behaviors and different needs for information and collaboration.

We argue that MIL may be seen as an example of best practice² in blended learning. In addition, MIL is a learning space where best practice is under constant negotiation and reconstruction as an inherent, integrated part of the learning process.

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¹ We are collaborating on a project supported by the board of universities on the use of video resources in higher education. The project will result in a web portal on the use of video in education.

² The Ministry of Science in Denmark have nominated MIL as an example of best practice, see http://www.e-kompetencer.dk/rapport_03.html#3.2.3

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Suitability of a Virtual Learning Environment for Higher Education

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Abstract: The number of virtual learning environments (VLEs) is increasing. Already a few case studies claim that VLEs are more effective as a learning method than traditional lecturing. Many of these case studies are in the area of information and communication technology (ICT). Therefore, the good learning results are not surprising.

The aim of this paper is to examine the suitability of a VLE for higher education by comparing learning with a VLE and learning in a traditional lecture on an occupational safety engineering course. We will compare the learning results and the students’ opinions of their learning process.

The results show that the VLE students outperformed the lecture students. On the basis of these results and previous case studies, the VLE is suitable for higher education. Nevertheless VLEs should be used with caution in higher education. They should add extra value to a course. One possible value would be to use the VLE self-study method to evaluate one’s learning before a final exam.

Keywords: virtual learning environment, occupational safety engineering, higher education, comparison of learning

1. Introduction

The number of new virtual learning environments (VLEs) is increasing and they have been advertised as being a solution for remote and cross-border education. Students can perform a wide range of exercises with a computer-based learning environment. This is extremely important when the tasks cannot be practised in real life, for example due to their hazardous nature. For this reason, simulators have been used for years (Wickens 1992) to train pilots and operators in nuclear power plants. Virtual Reality (VR) is also a good tool for practising safety skills. Kizil & Joy (2001) and Filigenzi et al. (2000) have assessed VR for improving miners’ safety. Walker and Harrington (2004) have found in their studies that computer-based training is an effective safety training tool.

Many studies report the virtual learning environment as more effective, efficient and satisfying than the traditional learning situation. In recent years, several case studies (Piccoli et al. 2001, Kekkonen-Moneta and Moneta 2001, Marandi and Luik 2003, Zhang et al. 2004, McDonald et al. 2004) have dealt with the use of VLEs in teaching information and communication technology (ICT). The case studies have most commonly been related to the learning of basic types of IT skills, for example word processing, which everyone should master in order to study or teach full-time. This fact has probably increased the motivation to learn and explains the good learning results. Our case study is different since our students are not studying how to use computers. Also, the students in our case are obliged to study the subject in order to obtain their Master’s degree.

The aim of this article is to determine the suitability of a VLE for higher education. We will first look at some previous case studies concerning VLEs in higher education. Also, we will present briefly the case studies concerning safety education and VLEs. Then we will introduce our own case study. Our case study is a comparison of a traditional lecture and a VLE for occupational safety, called Virtu. At the end of our paper we discuss the suitability of VLEs in higher education and suggest further research ideas.

2. Previous case studies of virtual learning environments

Comparisons of traditional classroom learning and studying with a VLE have been carried out for example by Piccoli et al. 2001, Kekkonen-Moneta and Moneta 2001, Marandi and Luik 2003, Zhang et al. 2004, McDonald et al. 2004) have dealt with the use of VLEs in teaching information and communication technology (ICT). The...
al. (2001), Kekkonen-Moneta and Moneta (2001), Marandi and Luik (2003), Zhang et al. (2004) and McDonald et al. (2004). Both Piccoli et al. and Kekkonen-Moneta et al. used a VLE to teach basic IT skills, Marandi and Luik used a VLE to show teachers how to implement ICT in teaching, Zhang et al. used a VLE to synchronize video presentation with PowerPoint slides and lecture notes and McDonald et al. reported experiences of using a VLE at university.

Piccoli et al. (2001) arranged an experiment that lasted one semester. The test conditions were accurate in order to enable the use of statistical methods. A total of 146 undergraduate students participated in the experiment, which concerned a course in basic IT skills. The hypothesis stating that students in the VLE would score higher points in the exam than the students in the traditional classroom was not supported by the findings. The VLE students outperformed the traditional classroom students, but the difference was not statistically significant. The hypothesis regarding a difference in satisfaction between the VLE group and the control group was correct. Surprisingly, the students in the VLE group were less satisfied.

Kekkonen-Moneta and Moneta (2001) compared the learning experience and the learning results of college students. The students were studying course Computing Fundamentals. One group (105 students) studied through lectures and the other (180 students) by an online course. Both groups had weekly laboratory sessions with a teaching assistant. The assessment was based on a midterm examination. The examination included multiple-choice questions for testing students’ learning and questions for estimating the students’ IT skills. Overall, 261 students participated in this study. This study showed no differences in learning or satisfaction between these two groups. The students in the lecture course performed in the conceptual questions better than students in the online course. However, the online course students perceived the course as less difficult than students in the lecture course.

Marandi and Luik (2003) compared the use of the WebCT learning environment with traditional face-to-face teaching from the point of view of effectiveness and of improving students’ IT skills, knowledge and attitude. The study was conducted in order to help Estonian teachers utilize their computer software and Internet connections. A group of 39 teachers was divided into two groups; one group used the WebCT (27 teachers) and the other group studied in the traditional way (12 teachers). Both groups studied subjects related to computers and teaching or learning. After the course, a questionnaire was sent to the participants to be completed and returned voluntarily and anonymously. In this study the learners with the WebCT were more satisfied and self-confident with their computer skills.

Zhang et al. (2004) conducted two experiments in which they compared a prototype of a Virtual Mentor (VM) system called “Learning By Asking” (LBA) with traditional classroom teaching. Altogether 52 students participated in the e-learning group and 51 students in the traditional classroom group. All participants were undergraduate students. The same instructors taught both groups and ensured that the material was the same for both groups. The effectiveness of learning was measured by test grades (objective approach) and questionnaires (subjective approach). In this experiment, the students in the e-learning environment got significantly higher grades than those in the traditional classroom situation. However, in this case the satisfaction level between the groups did not differ significantly.

McDonald et al. (2004) compared students’ performance in the traditional classroom and in an online course. The data was collected over a period of two years. The data included students’ final grades from this course and information on students’ overall performance at the university. In the traditional classroom group there were 134 students and in the online group 63 students. The results showed that students who studied in the traditional classroom outperformed the online students. The authors discussed whether one reason for this could be the long history of using traditional lecturing at the university. Also, the development of a good online course takes time. However, they also concluded that further research is needed to determine the real reasons for these results.
Both VLE and VR are used in safety training. For example Filigenzi et al. 2000, Harrington & Walker 2004 and Walker & Harrington 2004 have concluded that VLE is an effective safety training tool. Filigenzi et al. (2000) and Kizil & Joy (2001) have used VR for miners’ safety training. After the training, students’ ability to identify hazards had improved. They also concluded that VR technology improves miners’ safety. (Filigenzi et al. 2000, Kizil & Joy 2001) Walker and Harrington (2004) compared the effects of computer-based learning and instructor-led training in fire safety. They found that the computer-based group used less time than the traditional lecture group for the training, so the computer-based learning might be more effective than traditional lecturing. Nevertheless, they were not able to change attitudes towards occupational safety using computer-based learning (Harrington & Walker 2004).

VLEs have advantages compared with traditional teaching. When different teachers lecture on the same topic, no two lectures are ever exactly the same. Furthermore, the same teacher hardly ever repeats the same lecture in exactly the same form or with exactly the same content (Walker & Harrington 2004). Lecturers can demotivate students with their routines. On the other hand, VLEs are a flexible way of teaching (Walker & Harrington 2004) because they can be used at the most convenient moment (Clarke 2001). Students do not have to follow a specific timetable, as they would have to do with traditional lectures, and therefore they cannot miss a lecture (Walker & Harrington 2004). Lee et al. (2002) found in their study that positive attitudes towards using computers were the key factor in the VLE’s success. Students’ positive relationship to computers helps also the learning process (Lee et al. 2002, Crosier et al. 2000).

3. Methods

3.1 The course

The comparison presented in this article is based on two comparisons related to the course Introduction to Safety Engineering. The course is offered by the Institute of Occupational Safety Engineering at Tampere University of Technology (TUT). TUT had altogether 10120 students at the time of the study, of which 1997 (19.7 %) were female students (Fagerström 2004).

The course Introduction to Safety Engineering is usually the first one students take at the Institute. The course consists of lectures, all covering different areas of occupational safety engineering, such as ergonomics, risk management, occupational hygiene and accident prevention. The course is held three times per year: once in the autumn semester, once in the spring semester and once in summer. Over 600 students complete the course annually. The students are divided into small groups (approximately 30 students per group). In autumn and spring, teaching consists of two lecture hours per week for seven weeks. In the summer course, the lectures are given during one week, three hours per day. Also, twice a year the students have the opportunity to complete the course in a virtual classroom. Once a year the course is offered to the international students.

3.2 Empirical setup of comparison

The comparisons presented in this article were conducted in summer 2004 and autumn 2004. All the students taking part in the comparison had Finnish as their native language. In the summer course the students were divided into two groups (24 and about 40 students). Of the two groups, one was chosen for learning by VLE. The other group (the control group) studied the whole course via traditional lecturing. The first group also received all teaching in the normal traditional way, except in the case of occupational hygiene, which they studied by VLE. In the autumn course the students were divided into 10 groups (altogether approximately 300 students). Of these groups two were selected for the study: one group studied by VLE and the other studied through traditional lectures. This study did not affect the other eight groups at all; they studied the whole course through traditional lectures. The empirical setup of the comparison is presented in Figure 1. All the stages are described in detail below.
Theme: Occupational hygiene

VLE session
Lecture
Exam
Questionnaire
Questionnaire

Figure 1: Empirical setup of comparison

3.2.1 The virtual learning environment

In this study we used a VLE in occupational safety called Virtu. Virtu was developed in a co-operative project between the Institute of Occupational Safety Engineering and the Institute of Software Systems at TUT. Virtu has traditional VLE content (see Fig. 2), such as theory and exercises (the so-called textbook), but it also contains a virtual enterprise by means of which a visit to a real company is simulated (also reported by Ihamäki & Vilpola 2003, Kiltti & Koskela 2003). All the texts in Virtu are in Finnish. The textbook has several occupational safety related topics. Virtu was developed according to a user-centred design process (Ihamäki & Vilpola 2003).

Figure 2: Structure of VLE Virtu

3.2.2 The students

In the VLE learning sessions there were 54 students; 47 males and 7 females (13.0%). The proportion of female students is about one third lower than the overall proportion of female students at TUT. The students enrolled in the course without knowing about the experiment. Most of the students (70.4%) have chosen the course because they were obliged to study the subject. Only two of the students had completed other courses at the Institute of Occupational Safety Engineering. However, 26 (48.1%) students had some kind of safety training from their summer job (fire safety, electrical safety, etc). Among these 54 students, the grade expectations were high; only six students just wanted to pass the course. Most of the students (33) wanted to get good grades, i.e. 3-5 (the scale is from 1 to 5, with 1 as lowest and 5 as highest grade).

About 74 students were taught by the traditional lectures. In the summer, due to the lack of space in the classroom, not all of the lecture students were able to take part in this study. Fifteen students voluntarily answered the exam and the questionnaire. From the autumn course 34 students took part in this study. To sum up, the control group consists of 49 students, 37 male and 12 female students (24.5%). The proportion of female students is larger in the control group than among the overall students at TUT. Most of the students (65.3%) have chosen the course because they were obliged to study the subject. Two students had completed other courses at the Institute. Also, 23 (46.9%) students had some background knowledge of safety issues. For example, many students had had safety training from their summer jobs according to a specific job description or in personal protective equipment (PPE). Eleven students wanted just to pass the course. Over half (26) of the students wanted to pass the course with the grade 3 or higher.

3.2.3 The learning sessions

The Virtu learning sessions were organized in one of the computer suites at TUT. Each student had his or her own computer to work with. The students were told that they were expected to study occupational hygiene, to work independently and to study as they saw fit. They were given a maximum of 1.5 hours to study occupational hygiene with Virtu and complete the exam. The time of using Virtu and of completing the exam was measured. The students were allowed to make notes while studying. Finally, after the exam, the participants were asked to fill in a questionnaire.

In the summer, the students taking part in purely traditional lectures did not get any material before the lectures, but the material (slides) was available on the Internet after the lectures. The lecture in occupational hygiene followed a normal structure: during the lecture, several transparencies were shown. The lecturer also related examples regarding occupational hygiene. The students were
able to ask the lecturer questions. The lecture lasted about 45 minutes. After the lecture the lecturer asked about half of the students to remain in the classroom. Then the students were told that there would be an exam on occupational hygiene and a questionnaire.

During the autumn course, students were able to print the slides for the lesson beforehand. A different lecturer taught the course than in the summer. Otherwise the lecture followed the same structure and had the same content as the summer course had. The lecture lasted 50 minutes, covering also a short group work session on the different agents of occupational hygiene. After the lecture the students competed the exam and the questionnaire.

### 3.2.4 The exam

After the learning session the students had a closed-book exam. The exam questions concerned the issues learned in the learning session. It was the same for both groups. The exam was fairly short, covering only one A4 sheet. The students had to enter their names on the exam paper. The exam started with two multiple-choice questions about the basic definitions in the subject area. The remaining three questions were open-ended: the students were asked to write freely about what they remembered on the subject. The maximum obtainable score was 14 points.

### 3.2.5 The questionnaires

After the exam each student filled in a questionnaire. The purpose of the questionnaires was to gather subjective information about the VLE and the lecture. The two questionnaires were constructed as similarly as possible, in order to be able to compare the answers of these two groups. The questionnaire included questions concerning earlier education in safety engineering and students’ grade expectations from the course. To enable comparison of this background information with the learning results, students had to enter their names on the questionnaire.

In the VLE questionnaire students were asked to mark all parts of Virtu that they used during the session. In this way versatility in using Virtu could be examined. The Likert scale from 1 to 5 was used to measure the ease of use, suitability, comfortableness and quality of the content in the VLE. If students chose one (1), it meant that they strongly disagreed. In contrast, if they chose five (5), it meant that they strongly agreed. A questionnaire incorporating positive and negative statements about the same subject was used in order to ensure that students properly understood what was intended by the statements. The questionnaire included also open-ended questions about good and poor features, and the use potentials of Virtu.

In the lecture questionnaire, the students were asked to rate the lecture according to their own learning and the usefulness of the content. These were evaluated using the Likert scale from 1 to 5. One corresponded to ‘very little’ and five to ‘very much’. Also, the students estimated the efficiency of time use. This was evaluated with the Likert scale from 1 to 3, where the numbers 1 and 3 corresponded to ‘too much’ and ‘too little’, respectively.

### 4. Results

#### 4.1 Time used

The VLE students studied independently and quietly. Most of the students studied only the theory of occupational hygiene and did not visit the other areas of Virtu. After 19 minutes of studying, the first student returned the CD to the supervisors and started the exam (see Table 1). Over half of the students (53.7 %) returned the CDs during the next 5 minutes. After the first rush, students ended the studying at quite steady intervals. The last student returned the CD after 44 minutes of use.

In the summer, the lecture lasted about 45 minutes and in the autumn 50 minutes.

<table>
<thead>
<tr>
<th>Time (min)</th>
<th>Persons (N=54) returning VLE</th>
<th>Persons (N=54) returning VLE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 20</td>
<td>1</td>
<td>1.9</td>
</tr>
<tr>
<td>20-25</td>
<td>22</td>
<td>40.7</td>
</tr>
<tr>
<td>25-30</td>
<td>18</td>
<td>33.3</td>
</tr>
<tr>
<td>30-35</td>
<td>7</td>
<td>13.0</td>
</tr>
<tr>
<td>35-40</td>
<td>2</td>
<td>3.7</td>
</tr>
<tr>
<td>&gt;40</td>
<td>4</td>
<td>7.4</td>
</tr>
</tbody>
</table>

#### 4.2 The learning results

In the VLE group, previous knowledge in occupational safety did not affect the results. Students with such knowledge did not score higher points than others. Table
2 presents the points received for both groups. Of the VLE students, 20 were able to score the maximum points in the exam. On average, the VLE students scored 13.0 points (standard deviation 1.3). The points for multiple-choice questions were on average 9.5 (0.8) and for the open-ended questions 3.6 (0.7).

**Table 2:** Points received among the VLE students and lecture students

<table>
<thead>
<tr>
<th>Points received</th>
<th>Persons (N=54) in VLE</th>
<th>Persons (N=49) in the lecture</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 10</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>10-11.75</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>12-13.75</td>
<td>26</td>
<td>23</td>
</tr>
<tr>
<td>14</td>
<td>20</td>
<td>5</td>
</tr>
</tbody>
</table>

Figure 3 describes the effect of studying on the points received. Students who studied longest with the VLE got better results than those who studied the shortest time. The correlation is not very strong.

For the students who attended the traditional lecture, previous knowledge in occupational safety did not affect the results. Only five students were able to score the maximum points in the exam (see Table 2). On average the students scored 11.5 points (standard deviation 2.2). The average score for the multiple-choice questions was 8.2 points (1.7) and for the open questions 3.4 (0.9).

4.3 Subjective experiences

The students’ opinions of using Virtu are presented in Table 3. Overall, the students found Virtu relatively easy to use. Almost all of the students (94.4 %) thought that one could easily learn to use Virtu. None of the students though it was hard to study with Virtu. However, every fifth student (22.2 %) did not have an opinion on this matter. Also, none of the students thought that Virtu could not also be used in other Occupational Safety Engineering courses. Since most of the students had not taken other courses at the Institute, it is not easy to estimate the suitability of Virtu for such courses. However, half of the students did not have an opinion on this matter. Since occupational hygiene was dealt with in the second-last lecture, the students had some idea of the suitability of Virtu for the whole course. Many students (84.7 %) thought that Virtu was suitable for studying the subjects on the course. Also, most of the students would use Virtu at home, if they had it.

**Table 3:** Students’ opinions on using Virtu (the statements are translated from Finnish)
<table>
<thead>
<tr>
<th></th>
<th>No opinion (%)</th>
<th>Strongly disagree (%)</th>
<th>Disagree (%)</th>
<th>Agree (%)</th>
<th>Strongly agree (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I learnt quickly to use Virtu</td>
<td>0.0</td>
<td>1.9</td>
<td>3.7</td>
<td>33.3</td>
<td>61.1</td>
</tr>
<tr>
<td>It was easy to study the subject with Virtu</td>
<td>22.2</td>
<td>0</td>
<td>0</td>
<td>61.1</td>
<td>16.7</td>
</tr>
<tr>
<td>The content of Virtu was versatile enough</td>
<td>22.2</td>
<td>3.7</td>
<td>13.0</td>
<td>40.7</td>
<td>18.5</td>
</tr>
<tr>
<td>I would learn better in face-to-face education</td>
<td>48.1</td>
<td>5.6</td>
<td>27.8</td>
<td>11.1</td>
<td>7.4</td>
</tr>
<tr>
<td>I would use Virtu at home if I had it</td>
<td>0.0</td>
<td>9.3</td>
<td>53.7</td>
<td>27.8</td>
<td></td>
</tr>
<tr>
<td>I think Virtu could be used in other Occupational Safety Education courses also</td>
<td>50.0</td>
<td>0.0</td>
<td>0.0</td>
<td>37.0</td>
<td>13.0</td>
</tr>
</tbody>
</table>

The students mentioned three good features (clarity, exercises and own space) of Virtu in the open-ended questions. The students (19 mentions) found Virtu to be very clear to use. For example, the students said that Virtu did not include too much information. Also, the exercises were liked: 15 students mentioned them in the open-ended questions. Many students (19) appreciated that they were able to control the speed of studying themselves. Almost half of the students (48.1 %) said that Virtu could be used as a self-study method. Eleven students thought it could be used during the lecture (by the lecturer). One student wanted to connect the self-study method and the lecture. The student liked the experiment with Virtu (“You had to do something yourself, you were not able to fall asleep during the lecture”). Another student mentioned that he would prefer the VLE to the slides when revising for the final exam. Although the clarity was liked, 44.4 % of the students thought that the content of Virtu was a bit limited. For instance, they considered the exercises were too easy or too few.

Overall the lecture was liked. The students thought the best part of the lecture was the group work. It brought the subject closer to real life. The students were also asked to rate the lecture according to their own learning and the usefulness of the content. Most of the students (93.9 %) estimated that their learning was at least ‘moderate’. The students considered the content to be quite useful for them: 25 students rated it ‘moderate’, 16 ‘good’ and 3 ‘very good’. When the students were asked to evaluate the time used, almost all of them (93.9 %) were satisfied. Only three students would have liked to have studied longer.

5. Discussion

Based on our case study and the presented previous case studies, we can conclude that the VLE is suitable for higher education. Piccoli et al. (2001), Marandi and Luik (2003) and Zhang et al. (2004) proved VLE to be more effective than traditional lecturing. Kekkonen-Moneta and Moneta (2001) were not able to determine any difference. McDonald et al. (2004) concluded that their VLE should be improved, because the learning with the VLE was not effective. In the following, the limitations of our research and our conclusions are discussed.

First, two different lecturers taught the students. As mentioned on page 5, when different teachers lecture on the same topic, no two lectures are ever exactly the same. Due to the vast number of students completing the course annually, it is impossible for just one lecturer to lecture to all of the students every year. However, since it is an introduction course, the content of the lectures do not vary that much between the lecturers.

Second, we compared only short-term learning. The results of long-term learning could be different. To measure long-term learning among university students is very difficult. Many things can affect the results. The students are able to take more courses in the area of occupational safety engineering. Also, more and more companies train employees (also summer trainees) in occupational safety issues. It is easier to examine the quality of long-term learning in corporate safety training than among students studying at university. Consequently, it would be
advisable to carry out comparative testing also in companies.

Third, our case study was not a true comparison of VLE with a lecture. The students had to stay in the computer class and study the subject using VLE. The VLE session was not truly independent of time and space, as it should be.

The two groups did not differ significantly in terms of background variables (e.g. learning results, earlier safety knowledge and sex ratio). Therefore, the results for the two groups are comparable. The VLE students used less time to study the subject than the students receiving the traditional lecturing. The computer class is an open environment, which might have some effect on the learning experience due to social pressure. Obviously, no one wanted to be the first student to return the CD-ROM and start the exam. However, after the first rush, the VLE students ended studying at quite steady intervals. This suggests that the time record is accurate.

All of the VLE students returned the CD-ROM to the supervisors by the time the summer lecture ended. However, noteworthy is that the students receiving the traditional lecturing did not feel they had been studying very long. In fact, three students wanted to study even longer. On the other hand, learning via lecturing is somewhat different. Often the exercises follow the lectures and so students have more time to process the information. In real life the learning process lasts longer than a mere lecture. Virtu combines the lectures and the exercises and therefore gives a better estimate of the time used to study. The time used to study suggests that the VLE is an effective learning method. The effectiveness is further supported by the learning results. The VLE group scored systematically higher points than the traditional lecturing group.

As already found by Lee et al. (2002) and Crosier et al. (2000), a positive attitude towards computers increases learning. In our case study the students were studying at a university of technology and therefore they might have a more positive attitude towards computers than average people. This could be one reason why the VLE students outperformed the lecture students. This is a second reason why the testing in corporate safety training is needed.

A good feature of VLEs is that students can themselves control the speed of studying. The VLE students appreciated this feature. They are able to return to some area if they do not feel confident about their knowledge of it. In principle, students have the same opportunity during traditional lectures: students can ask the lecturer questions. Sometimes students are embarrassed about asking questions and admitting lack of knowledge. When using a VLE, others do not know what you are doing. This works also the other way around. When studying with a VLE, one can skip the area that is familiar for oneself. The normal lectures do not provide this opportunity and this may frustrate some of the students.

Many lecturers are trying to find ways to change their lectures because students are “sleeping” during lectures or are concentrating on something other than the subject of the lectures. Lectures which active students could be an answer. One student in our study welcomed the change Virtu offered to lectures. Generally, TUT has relatively few virtual courses and therefore they are still considered mainly a means of providing variety in addition to normal lecturing. However, VLEs must be used with caution. VLEs must add something special to the course or the subject. VLEs have indisputable advantages in safety training. When we are dealing with humans (occupational safety), we do not have the possibility of learning by trial and error. An additional value of VLE could be the possibility to use VLE also at home as a self-study method. Students would be able to study when convenient. The exercises in the VLE would help the students to evaluate their own learning.

As VLEs have been proved to be suitable for higher education, we cannot form conclusions regarding their superiority over traditional lectures in every situation outside higher education. VLEs have been proved to be particularly successful in so-called introduction courses. VLEs can be used to standardize the teaching of a large number of students in their early step of studies. Usually a vast number of students complete these introduction courses, so it would be profitable to target the VLEs for
these courses. Lee et al. (2002) emphasized the positive attitude as a success of VLE. So, in order to get good learning results with a VLE they need to be designed well and the needs of the user group must to be considered thoroughly. Bad design quickly demotivates the students.

The VLE Virtu will be next tested in corporate safety training in order to determine its suitability for older people. Corporate safety training gives a better estimate of long-term learning, because we can better control the safety-related training received by the employees than that received by students who can complete safety courses at the university or have safety training in their summer jobs.

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IT Support of Competence Based Learning in Groups in a Distance Learning Environment

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Abstract: In this paper the design of a workflow support tool for competence based distance learning in a group setting is discussed. The design is based on a stakeholder analysis and crash-tested in an actual course setting. Preliminary findings suggest that some well-known problems have been solved, but further more in depth research is needed to assess the quality of the design with respect to more subtle issues.

Keywords: Competence based learning, group setting, workflow support, group management.

1. Introduction

Recently, the Open University in the Netherlands (=OU) has endorsed competence based learning as the future didactical framework for course development and exploitation. The Open University is an institute, which provides distance-learning courses. Typically, the students have already some working experience and are eager to develop their careers. Students are increasingly critical with respect to the quality of the education they get from the OU. In addition, government funding is under constant pressure, which limits the resources available for course development and exploitation. For training students in business process engineering, the OU uses competence based distance learning in a group setting (GCBDL Courses). Typically, business process engineers operate in multi-disciplinary groups, and the success of a business-reengineering project very much depends on collaboration and communication skills of the group participants. In addition, collaborative learning stimulates the communal sense with students (Seufert, 2002). Research by Kear and Heap (Kear&Heap, 1999) suggests that although students complain about the additional overhead and limited freedom of collaborative learning, the majority of the students believe universities should continue in providing collaborative learning courses. Thus, academic discussion and interchange of ideas is stimulated providing a noticeable added value to the participants. The Internet as a medium for communication within distance learning has opened new possibilities of distance learning in general.

Competence based learning has received much attention from a didactical perspective, in which predominantly the effectiveness of the learning processes of the students is addressed. In addition, much attention has been paid to the development of electronic learning environments, in which the presentation of course content and rather crude communication facilities was paramount (e.g. see Martin, 2003). Unfortunately, almost no attention has been paid to the consequences of competence based learning on a large scale and on a routine basis. Some courses at the Faculty of Management Science at the OU already follow the pattern of competence based learning, and first informal experiences indicate that, in particular during the exploitation stage, amongst other issues, the administrative workload for students and supervisors can be prohibitive and that supervisors and students sometimes lack control to finish their assignments on time.

In this paper, we will focus on the implementation aspects of this type of GCBDL courses on a routine basis. We will analyse systematically the workflow requirements, which are associated with this type of course from an industrial engineering perspective. This analysis will serve as a basis for improvement of the workflow. In particular, we will concentrate on the potential for improvement of GCBDL-supporting information systems. We will use the business-reengineering course as a test case. This course is offered to about 100 students per year, who start in batches of about 15 to 20 students from several different master
programs at various moments throughout the year. In addition, some course material is used in a similar setting for company training purposes. External supervisors are contracted as needed.

2. Problem definition

The competence based learning strategy leads to courses where students are put in a realistic situation in which they have to demonstrate if and how they solve certain problems. Absorption of cognitive knowledge is considered insufficient. The key objective is to be able to use knowledge to solve realistic problems. In practice, this learning strategy can be translated into course patterns, which make use of case descriptions and assignments for groups of students. On an academic level, the assignments typically require the students to make an analysis and construct a systematic and clear argument for a solution. Compared to traditional cognitive based learning approaches, such assignments will require manual feedback from scarcely available professional supervisors. In addition, supervisors have to keep track of the students’ states and the responses as the “body of evidence” for the students’ assessment. Although no formal in-depth studies have been discovered in which traditional courses are compared with similar scoped GCBDL-courses, experienced supervisors estimate the extra effort roughly to about 2 to 3 times compared to a traditional course design. Veen et al (Veen, 1999) reports similar findings on a workload increase with GCBDL-courses.

In general, regular course evaluations suggest that many students perceive that GCBDL-courses increase the workload. It is no longer sufficient to prepare for a single examination, but instead, the students have to produce a full final report, which they all have to agree upon, and possibly several written responses to intermediate assignments. All these symptoms, may be acceptable if competence based learning is used incidentally. However, if used on a routine basis some further research seems justifiable.

Our basic research question boils down to: “How can we implement GCBDL courses efficiently?”.

2.1 Methodology

The symptoms identified in the previous section indicate that we need to analyse the workflow of GCBDL courses to understand its management and administration problems better in order to be able to facilitate a GCBDL-workflow. We will follow the design cycle as the primary guideline in our approach. The design cycle entails the following stages:

- **Determine design objectives:** In this first stage we need to determine what criteria are relevant and must be met for an acceptable workflow. Besides the course design criteria we need to determine what stakeholders exist and what their requirements actually are.
- **Considerations for design:** In this stage, the requirements from the previous stage have to be interpreted and related to the main options for facilitating the workflow. Finally, the most suitable options will be chosen for the development of a prototype instrument.
- **Develop a prototype:** A full prototype version of the workflow support instrument will be developed and discussed.
- **Evaluate prototype:** Eventually, a prototype needs testing. In this stage a working version of the workflow instrument will be put to the test with a real life course.
- **Re-iterate if necessary:** In case the evaluation reveals shortcomings in the prototype, the design cycle can be re-initiated at each previous design stage.

2.2 The design of a workflow

2.2.1 Stakeholder analysis

For a successful design of a workflow support system it is essential to have a clear picture of the relevant stakeholders, or actors in this case and what their interests in such a workflow support system would be. In the following sections we will discuss the stakeholders and their interests in depth. The insights presented here originate from regular evaluations that are carried out after each course run of the Business process engineering course and regular evaluation meetings with supervisors and examiners of this course.
**Developer**

The didactical model, used or designed by the developer, is leading for all other roles. The developer is more or less a generic role, he may comprise a team with mixed specialisations in the content area, pedagogy, programming, legislation, finance, etc. Course development may require some attention to project management. In particular, if the course material is novel and not much existing content can be reused. Besides, achievement of the quality standards for educational content demanded by the institution offering the course and the accreditation boards, other secondary requirements must be met by the developer. Depending on the situation at hand, a wide variety of restrictions must be taken into consideration. Implementation of a course in a routine workflow is considered an administrative duty, for which any effort should be minimised.

**Examiner**

The examiner, being responsible for the examination of students, is an officially appointed expert on the course material at hand. He assesses the performance from the student using the standards the developer of the course has set. The outcome of such an assessment is usually summarised in a number from a preset range. The standards may encompass many heterogeneous aspects such as the level of knowledge that has been accumulated, the throughput time to complete the course, the amount of supervision that was needed to guide a student towards the completion of a course, etc. Much of the feedback of intermediate course assignments can be delegated to a so-called supervisor role. In that case the examiner requires that supervisors adhere to his standards for providing feedback in terms of timing, content and student progress in general. The examiner rating has a legal status, i.e. disputes between students and examiners may be taken to court if conventional arbitration fails. This emphasises the administrative precision and formalism the examiner has to practice.

The examiner must collect all evidence in support of his assessment and he must assure that the course has been followed in conformance with the prescribed didactical model.

**Student**

The student is the main beneficiary of a course. He executes the assignments and tests prescribed by the examination standards in accordance with the didactical model. The student’s main motivation comprises two elements.

- a gain in competences on the particular area the course within the program he selected and;
- the certificate he receives upon successful completion, which in turn, depends on a positive rating by the examiner.

Ratings and comments from a supervisor or the examiner must be clearly linked to student responses to the required assignments.

Secondary, but nevertheless, important motivational aspects are the facilities that are provided in order to help him to complete a course successfully. Typically, in GCDBL-courses additional effort is needed to manage the group process. If a GCDBL-course is large and involves a substantial number of assignments over an extended period of time, project management type of control of the group progress may be welcomed.

**Manager**

The manager is responsible for the overall economic efficiency and the market validity of the courses offered to the students, a.k.a. the clients of the educational institution. The manager makes the decisions to introduce a course or a program to a certain market and what features are needed for a successful exploitation, the development cost that can be justified and the management that is required for the development, promotion, maintenance and exploitation of a course. Given the wide range of responsibilities, this role is seldom attributed to a single person within an organisation. In the end, the dean is formally responsible for all aspects mentioned here, but ideally, all individuals involved in the processes mentioned above will carry this responsibility more or less implicitly.

The manager role is interested in the overall efficiency of course runs per course. The effort spent by the supervisors, examiners, and students is monitored and should not exceed a preset
Additional quality requirements such as the percentage of students who completed a course successfully and qualitative student evaluations complement the manager’s information requirements. The manager has no direct involvement with an individual course run. Due to budget pressure this role has gained in importance significantly and will have a much larger impact on a work flow system than a few years ago.

Supervisor

The supervisor acts as an intermediate between the student and the examiner. The supervisor assists the examiner in collecting “evidence” of the student’s performance during a course run. In addition, he is the first member of staff a student contacts in case he requires assistance, advice and feedback on his work. The supervisor is also responsible for the progress students are making. To do this, the supervisor needs to know the actual planning of the students at any time. Depending on the course requirements and the sophistication of the course material, a supervisor may not need to have full expertise on the content subjects of the course at hand. In such cases, a supervisor’s responsibility is to stimulate the student’s pace and to provide only basic safeguards from a content perspective. In other words, the supervisor resembles more a principal than an instructor.

Administrator

The administrator is responsible for the official admission of students to participate in a course. He may check the student’s admission qualifications before commencing with the actual enrolment of students. At the end of a course, an administrator may want to update the official student dossiers with the examiners rating and file any other required documents.

Veen et al. (Veen, 2001, and also Veen, Collis, Diepen & Andernach, 1997) have studied the management challenges introduced with collaborative learning extensively. His analysis can be summarised as twelve major problems of group workflow problems:

<table>
<thead>
<tr>
<th>Problem planning, operationalisation &amp; monitoring</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Groups do not have a clear picture of what is expected of them. planning</td>
</tr>
<tr>
<td>2 Groups have problems with planning and procrastination. planning</td>
</tr>
<tr>
<td>3 Groups have problems with organizing work between meetings. operationalisation &amp; monitoring</td>
</tr>
<tr>
<td>4 Groups have problems with access to deliverables and comments. operationalisation</td>
</tr>
<tr>
<td>5 Group members do not take a fair share of the work. operationalisation &amp; monitoring</td>
</tr>
<tr>
<td>6 Instructors lack overview of the progress of groups. monitoring</td>
</tr>
<tr>
<td>7 Different instructors treat groups in different ways. operationalisation &amp; monitoring</td>
</tr>
<tr>
<td>8 Instructors have difficulties to continue their work at a distance. operationalisation</td>
</tr>
<tr>
<td>9 Students have limited awareness of other group members. operationalisation &amp; monitoring</td>
</tr>
<tr>
<td>10 Conflicts arise due to poor communication. operationalisation</td>
</tr>
<tr>
<td>11 Students do not start using telematic support tools. operationalisation</td>
</tr>
<tr>
<td>12 Groups have to wait too long for instructor and peer comments. operationalisation &amp; monitoring</td>
</tr>
</tbody>
</table>

A workflow support system should address the problems identified above.

2.2.2 Design considerations

To address the requirements of stakeholders a number of facilities should be provided by a workflow support system. In the following section the most important design directions will be discussed.

Providing a structured path

Examining the way groups worked in an earlier version of the Business-reengineering course, which was not supported with workflow support tools, we have recognized a pattern described by McConnell (2002).

a) A long first phase characterized by considerable negotiation between the members of the group working closely together. Several sub-phases are evident in the groups' work.

b) A medium-length second phase characterized by the group organizing itself and busying themselves with particular parts of the research around the particular problem.
c) A short third and final phase, characterized by production.

Before students are asked to work in groups they will meet at least once at the beginning of a course run. We assume that no real substitute exists for getting acquainted quickly. No tool is provided for this stage of a group project. Also, at this stage it should be agreed upon who is responsible for what aspects in the workflow. In particular, the problems 9 and 1 in Veen’s list are addressed.

All assignment responses and comments should be archived, logged and made visible to the individual group members, supervisor and examiner, including all revisions of student responses and supervisor comments.

The supervisor role should have final control on when an intermediate assignment has been answered satisfactory and a group can move on to the next assignment (problems 4 and 6).

Monitoring deadlines

It is a group responsibility to set and monitor delivery dates for sending responses to (intermediate) assignments. Equally, supervisors have to answer within a preset time frame. Setting these time standards would allow an automatic alarm system sending appropriate warnings to all participants, who have trouble in meeting the deadlines. In addition, all assignment related communication events should be logged. Thus, all essential data is available in a formal and relatively indisputable way, which should minimise defensive behaviour of all roles involved (problem 6 and 12).

Maximum accessibility

Any support tool can be easily bypassed if users disagree with the way in which the tools more or less enforce a certain standard workflow. If this happens, the workflow itself is in jeopardy. In general, we assume that examiners and supervisors are bound to use the support tool and must be intolerant to any deviation. On the other hand, students may have very good reasons to reject the facilities provided to them. The tool may be too complex and requires a steep learning curve, or the technical requirements of the tool exceed the available PC specifications, to name just two of the more frequent reasons for rejection (problems 11 and 4).

A possible solution to this problem may be to provide the tool as a web-application which can be accessed by most browsers on any internet enabled PC anywhere in the world at all times. Secondly, the design objective could be to minimise the functions to those that are absolutely necessary and avoid a “Jack of all trades” approach (“Simplicity versus functionality”, see Veen, Collis & Jones 2001). The philosophy is that, the fewer functions are provided, the fewer reasons are available to bypass the tool. We expect that other tools available in the market, which the students can choose to their liking, can easily add missing non-critical functionality. In this setting, self-controlled selection of facilities provides the students with a certain degree of freedom to choose their own instruments and should actually encourage students to take initiatives and go ahead.

Simplicity as a design paradigm is also applied in the level of sophistication a workflow support system should have. We were looking for simple and robust solutions. E.g., instead of trying to design an advanced automated agent system that could act as the primary supervisor (see Palazzo et al., 1998), we concentrated on just making all relevant data easily accessible to a supervisor.

2.2.3 The basic workflow implementation

A workflow support tool, named the “Back Office” was developed to implement the requirements listed in the previous section. The Back Office was developed with Delphi 7 Enterprise Edition, IntraWeb version 5 and Firebird DBMS version 1.03. We have separated the workflow in roles. Each role has its own responsibilities and tasks in the overall workflow. For each role a separate web-application has been developed and installed on standard PC with permanent Internet connection.
Table 2: Key functions of the back office application

<table>
<thead>
<tr>
<th>Type of application</th>
<th>Role</th>
<th>Key functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>Examiner annex</td>
<td>Define/maintain course structure, assignments (group and individual)</td>
</tr>
<tr>
<td>W</td>
<td>Course developer</td>
<td>Define/maintain FAQ for supervisors to aid them in providing feedback to student work</td>
</tr>
<tr>
<td>W</td>
<td>Enroller annex</td>
<td>Compose/change student groups.</td>
</tr>
<tr>
<td>W</td>
<td>Administrator</td>
<td>Monitor individual and group process</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ability to email all or selection of all current participants</td>
</tr>
<tr>
<td>W</td>
<td>Supervisor</td>
<td>Manage course runs (timing) and authorise supervisors and enrollers</td>
</tr>
<tr>
<td>W</td>
<td>Student</td>
<td>Rate students</td>
</tr>
<tr>
<td></td>
<td>Due date monitor</td>
<td>Provide digital course material (for download only by students)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Export course run data to XML-file for offline analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>W= web based, A= automatic, runs once per night.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Email is sent by the web server, instead of a local email client and is referred to as “automated email”.</td>
</tr>
</tbody>
</table>

In parallel a monitor program runs daily to check if additional warning messages should be send and to perform automatic backups of the database. This monitor program introduces a “push element” into the back office, whereas traditional web applications are “pull-driven”. An action of a student or a supervisor always calls for another action. It is hoped that, in doing so, the likelihood that the group progress stalls is lessened significantly (see also Hauswirth 1999). The separate applications and their key functions are summarised in table 2.

Implementing the back office workflow.

To enable testing the workflow, a web-application and central database have been developed. All web pages resemble normal windows data entry forms. However, these forms are generated on a central server and displayed within a browser on a local PC. All persistent data has been modelled into a database management system accessed by the web-application. This implementation provides instant database update capabilities and access from users on any PC connected to the Internet. Access to a web-application is achieved with a login-procedure in order to protect the users’ privacy.

In addition to the support of the basic workflow several smaller enhancements were implemented to encourage users to use the back office. E.g. student groups have a shared file repository they can use privately. Scheduled assignments are presented graphically (see figure 1). Special attention has been paid to the help system for the student web application. Help is available in full text and so called Flash movies.
One of the design considerations was transparency of data. In the implementation, this aspect has been translated into extended logging of all relevant actions by any user and full visibility of the data that is related to a logged action. E.g. date and time are recorded of any assignment-related response from a student, which can be a typed response in the browser itself or via an upload of files. In turn, all supervisor comments are logged as well. In addition, all uploaded files, comments, etc. are visible and downloadable (see figure 2 for an example). According to Armatas (Armatas c.s., 2003) distance students value having full access to their own data and being in control of their schedule much more than on campus students do.

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**Figure 1:** A graphical presentation of a student schedule.

**Figure 2:** An example of a table showing all student assignment responses and comments from the supervisor.
3. Conclusion and future challenges

At the time of this writing the prototype workflow support tool (the Back Office) has been tested for stability with a number of groups of business reengineering students. So far, 5 groups with in all 20 students and two supervisors have used the Back Office on a regular basis for a period of about half a year. Students and supervisors were asked to report any dissatisfaction immediately to the research team.

So far, no in depth evaluation of this prototype and the considerations behind this software has been carried out yet. Therefore, no solid conclusions can be drawn at this time. However, no major complaints have been received from the students and the supervisors. Minor issues such as long upload times could usually be attributed to large bitmap files students have included with their responses. Once the students were made aware of this, further problems could be avoided. Remarkably few requests for support from students or supervisors were made. This may be an indication that the minimalist approach does work as desired. No students have rejected the tool.

The Back Office has solved some of the twelve problems identified by Veen (Veen, J. van der, 2001) right away. Groups have direct access to deliverables and comments (problem 4). This may not be a attributed to just appropriate tool design, but also to the quality of internet connections students have nowadays. However, a potential threat for any Internet based support tool is the Firewall policy of Internet providers. Although no real problems emerged during the first debugging tests, one can expect that different Firewall policies may seriously impair legitimate Internet communications.

Different instructors can now treat groups much in the same way and use the same criteria to support their feedback to the groups (problem 7). Further studies may be needed to discover if standard feedback, or FAQ lists, is the best solution indeed. Groups don’t have to wait too long for comments (problem 12). Automatic monitoring provides warning signals to those who are late with their task.

The problem of students not using telematic support tools (problem 11) and poor communication (problem 10) may not be as dramatic nowadays due technological advancements in communication technology and the widespread acceptance of these technologies by the students. At this stage, no complaints from students have been received, indicating that standard communication means were insufficient, or that the quality of student responses was hampered due to insufficient communication.

The remaining problems may be addressed partially by the Back Office and partially by the way in which a workflow is organised. The contribution of the Back Office in these problem areas does require further investigation. E.g. to assess whether group members do not take a fair share of work (problem 5) would require more insight on how groups actually allocate the tasks at hand. Unlike in classroom teaching, in which a supervisor is a direct witness of actual group processes, in distance learning a group process is largely hidden from the supervisors view. To ensure a sound group participation, different strategies can be followed. Daradoumis et al (Daradoumis, 2002) log all student events in their system, forcing students to route all of their communication to the official channel to achieve recognition (formative tracking). Such a system would require almost 100% uptime and total ease of use for the users to make this a serious option. A totally different approach is suggested by Seufert (Seufert 2002). He argues that if the learning environment and the working environment is connected, students will be more motivated as learning success can be transferred into their work and vice versa. However, this may be difficult to realise in practice. Vick & Johnson (Vick&Johnson 2005) solve this problem by providing specific software, which supports brainstorm and problem solving software for geographically dispersed group members. The software requires that all group members contribute evenly and synchronously. In a sense, a live guided discussion between group members is facilitated and logged for future references. So far, the problem has not been tackled with the aid of some back office functionality, but through course
design. Currently, for the Business reengineering course a strict pattern of responsibilities is agreed upon during a kick-off meeting at the beginning of the course, but this pattern is not strictly enforced. In addition, each individual student is required to send a personal reflection report on the group process and his personal perspective of his contribution.

The discussion presented above makes clear that the “Free-riders” problem is complex and needs further investigation.

Currently, the workflow doesn’t support groups or individuals within groups to interact with each other as a community. Lou (Lou, 2004) suggests that communities provide an even richer learning environment to students with unique opportunities to implement peer assessments. Further, long term research in this area is needed to explore the possibility to enhance our Back Office design with community building.

Implementations of group management software at the Fernuniversität Hagen (Haake et al, 2002) suggest that in the area of enrolment and group forming improvements can be made. In their implementation, individual students select the groups they want to collaborate with themselves. Initially, an individual in a student pool solicits for a group membership of a group of his preference. The existing group members have to accept, or reject the new applicant before moving on. This setting demonstrates three interesting benefits. Since students group themselves, essentially no significant support from the university staff is needed, saving valuable resources. In addition, all responsibility for the success of a group now rests solely with the individual group members. The university staff cannot be blamed for a failed group process. Also, batching students in groups at regular intervals introduces peaks in the workload of examiners and supervisors. In the pooling system, there is no need to batch group formation. As soon as there are enough students available, students can start grouping. Further assessment of the “Hagen” system is needed to discover if this method can be applied in a back office system at the OU as well.

References


\( ^{i} \) Delphi 7 is a registered trademark of the Borland Software Corporation.

\( ^{ii} \) Intraweb is a registered trademark of AtoZed software.

\( ^{iii} \) Firebird is a DBMS system distributed under Borland Interbase Public License v 1.0 at www.ibphoenix.com.
Teaching Scientific/Academic Writing in the Digital Age

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Abstract: This paper describes a graduate-level scientific/academic writing course for non-native speakers (NNS) of English at Ben-Gurion University of the Negev (BGU), Israel, which is taught in a technology-enhanced or blended learning environment. The use and integration of electronic discourses, such as email and Powerpoint, on-screen marking techniques, and submission of written assignments and writing consultancies by email, and asynchronous online discussion forums are described. Features of the HighLearn course-supporting WEB site, which enable the integration of discussion forums into the writing course, are explained. Results of teacher-initiated student evaluations and advantages and dilemmas of teaching scientific/academic writing in the digital age are discussed. The paper concludes with recommendations for future research and suggestions for the further integration of ICT in the scientific/academic writing course.

Keywords: scientific/academic writing; technology-enhanced learning; CMC/ICT; e-learning; asynchronous discussion forums; EFL

1. Introduction

There is no dispute that the digital age has affected our everyday lives in general and education in particular. This can be seen in the rapid developments in information and communication technologies (ICT), the multitude of Web-based tools available to institutions of learning, and the ever-increasing technical skills of students, all of which are changing the ways in which we teach and learn. In the field of language teaching, Warschauer (2004) states that the changes are most noticeable in written communication, where the reasons for writing and the written genres used, as well as the nature of audiences and authors, are undergoing modification, for both native and non-native writers, as a result of the proliferation and availability of ICT. In short, computer-mediated communication (CMC) has altered the way we write, the genres we use, how we send and receive information, and how we teach and learn (Barker 2002; Warschauer 2002; Warschauer 2004). Corich, Kinshuk, and Hunt (2004) note that the flexibility of e-learning and the increase in WEB-supported learning management systems have resulted in the recognition of potential applications of CMC for educational purposes. They emphasize the pedagogical value of CMC tools in general, and of online discussion forums in particular, stating that the latter encourage student collaboration on assignments, promote interaction between course participants, and enhance higher-level thinking skills (Corich, Kinshuk, and Hunt 2004).

In the field of scientific and academic writing, recent research has demonstrated that academic conventions are neither universal nor independent of particular disciplines (Hyland 2000, 2002; Hyland & Hamp-Lyons 2002; Johns & Swales 2002; Swales 1990). In other words, there is significant variation of discourses between and within disciplines. This has led to the concept of discourse communities and to an expansion in research on and materials for thesis and dissertation writing and supervision (Braine 2002; Johns & Swales 2002; Swales & Feak 1994, 2000; Weissberg & Buker 1990). It is recognized that good writers go through a number of processes, in particular writing and revising at each stage of the composing process, before the final product is produced (Chandler 2003; Chen 1997; Ferris 1997; Myles 2002). Good writers also share and discuss the writing process with others, are critical of their own work, and are aware of the genre(s), or style(s) of writing, used in their fields. Effective writing is thus the result of rewriting and revising, of going back and thinking before continuing to write. Writing courses based on how good writers compose, such as the graduate-level scientific/academic courses for nonnative speakers (NNS) of English at Ben-Gurion University of the Negev (BGU), Israel, are said to follow the process approach to writing.
The primary question facing teachers working with NNS of English in general, and of heterogeneous graduate-level courses in scientific/academic writing in particular, is how students' demands for personal relevance can be satisfied in multidisciplinary classes. In this paper I attempt to show that this demand for personal relevance can be realized when writing is taught in a technology-enhanced or blended learning environment. First, I briefly present relevant background information concerning the writing course itself. I then describe the integration and role of ICT in the writing course, focusing particularly on electronic discourses such as email and on-screen marking techniques and asynchronous discussion forums. Features of the HighLearn course-supporting, or course management, WEB site are briefly described. The results of teacher-initiated student evaluations are analyzed and the advantages and dilemmas/problems of teaching scientific/academic writing in the digital age are noted. The paper concludes with recommendations for future research and suggestions for the further integration of ICT in the scientific/academic writing course.

2. The writing course

2.1 Students

The Israeli and overseas NNS of English who participate in the scientific/academic writing classes at BGU are linguistically and culturally diverse MSc/MA and PhD students from a wide range of disciplines. Fields of study represented in a given semester have included the life sciences, chemistry, physics, mathematics, computer science, the health sciences, mechanical engineering, electrical engineering, industrial engineering and management, biomedical engineering, nuclear engineering, ecology, geography, economics, education, and comparative literature (Chinese and Hebrew).

Languages spoken as mother tongue have included Hebrew, Arabic, Russian, German, Spanish, French, Portuguese, Ukrainian, Armenian, Mongolian, Hindi, Nepali, Chinese, Amharic, and various languages spoken in Kenya, Zambia and the Gambia, with as many as 6-11 languages represented during any given semester. Students from Kenya, Zambia, the Gambia, Ethiopia, and India, who are quite fluent in English since they attend English-medium schools in their respective countries, elect to participate in the course in order to acquire proficiency in the specific genres of experimental research report writing and in the organization of academic research articles, and to present their research in the 'friendly' atmosphere of the English as a Foreign Language (EFL) classroom..

2.2 Location

Classes are conducted on two university campuses. Students in the Faculties of Science, Engineering, Health Sciences, and Humanities and Social Sciences study on the main campus in Beer-Sheva, ca. 100 km south of Tel Aviv, while students at the Jacob Blaustein Institute for Desert Studies study on the Sede-Boqer Campus, some 60 km south of Beer-Sheva. Hebrew is the primary language of instruction on the Beer-Sheva Campus, although English is used in English classes, such as the writing course, and in graduate courses attended by international students. At Sede-Boqer, all classes and seminars are conducted in English.

2.3 Course objectives

The faculties and institute expect that, as a result of participating in the course, students’ writing skills will improve so they will be able to communicate more effectively in English. The needs of the students, who are highly motivated and share similar goals, are twofold. Their immediate needs are to write a proposal, a thesis or dissertation, an article for publication, or a proposal for a conference presentation. Their long-term or future needs are to be able to communicate effectively in English in order to conduct research and publish their results, and to continue their studies towards a PhD or post-doc, often in English-speaking countries. The writing course attempts to meet these objectives and needs. Thus, the objectives of the course are to equip students with writing tools, and to provide them with relevant reference materials, so they will be able to write effectively and appropriately for their individual purposes; i.e. they will be able to express themselves in acceptable academic English ('acceptable' refers to norms within their fields and sub-fields).
2.4 Prerequisites

In order to be accepted as graduate students at BGU, international students must demonstrate knowledge of English, usually a passing score on the TOEFL examination. Israeli students must have successfully completed the nation-wide university undergraduate requirement for English or have received an exemption from studying English as a result of a high score on the national psychometric examination used by Israeli universities as an entrance examination. A prerequisite for the writing course is that students must have a well-defined research topic, an advisor/supervisor, and be actively involved in research. Since participation in the writing course is restricted to students who are ready to write a proposal, introduction and methodology, or an article for publication, most of the students have completed their first semester of graduate studies before they register for the course.

2.5 Course requirements

Assignments are content-based authentic tasks, which are submitted by email as Word attachments. All students are required to submit a CV (academic or job-related), one formal letter on a topic that is relevant and meaningful to them (Figure 1), a short abstract of 200-250 words, and either their MSc/MA/PhD proposal or introduction and methodology (thesis/dissertation) or an article for publication. Students are also required to participate at least once in three different online forum discussions during the semester. Because oral presentations and participation in seminars are difficult for NNS of English, the final component of the writing course is a 15-20 minute oral presentation, accompanied by appropriate visual aids (Powerpoint, slides, actual specimens, etc.), in which students discuss their research. In addition, at the beginning of the course, students are required to submit two academic articles representative of their field or sub-field. These articles are referred to during the course of the semester when looking at differences in genres, language forms, and formats of experimental research reports in the students’ fields.

- Apply for a job or academic position
- Request permission to use the library facilities at another university
- Ask for an interview with a colleague or specialist in your field
- Invite a colleague or specialist to visit you at your university
- Request a scholarship
- Inquire about a point you read in a research article
- Follow up a contact you made at a conference
- Submit an article to the editors of a journal for publication
- Request information about post-doc opportunities and conditions

Figure 1: Suggested topics for formal letter assignment

2.6 Framework

Scientific/Academic Writing is a one-semester course of between 12-14 weeks. Although each class is officially limited to 10-15 students, in practice 28-32 students enroll in the two classes each semester. Although students receive credit (2 points) for the course, since it is an elective in many of the departments, students “talk with their feet”. As Myles (2002) notes, it is thus crucial that written assignments and topics covered in class be perceived by the students as relevant and useful. A multiple-draft approach is used and students revise their work until they and the instructor are satisfied.

Classes meet once a week for three academic hours. Focus in the group sessions is on linguistic development, particularly language forms and conventions and common ‘language’ problems, in-class exercises and exercises assigned for homework. Topics covered include characteristics and conventions of scientific/academic writing such as organization, style, flow and presentation, cultural preferences for different writing styles, and acceptability of “World Englishes” (e.g., academic and informal English as written and spoken in the USA, Great Britain, Africa, India, etc.). Language patterns and grammatical choices are reviewed, even though students are familiar with tenses and active and passive voice, and terminology is kept to a minimum. Common areas of difficulty for NNS of English that are reviewed and practiced in class include countability, articles, prepositions, and connectors. Hedging and data commentary, common features of
experimental research report writing, are discussed in detail. Plagiarism is discussed in depth, especially since the student body is culturally diverse and because the Internet facilitates deliberate, inadvertent or poorly-informed plagiarism by students (Warschauer 2004). Citation- and reference-format is reviewed and students are urged to refer to professional journals and follow format acceptable in their fields and sub-fields. Students are also directed to free websites such as those providing online dictionaries, suggestions for making oral presentations and for writing CVs, and online writing labs/courses.

In the group sessions, students are encouraged to work in pairs or small groups. One might think that graduate students would indeed do so, especially since research in the sciences is often collaborative. However, most of the graduate students, including the Israelis, appear to prefer to work alone. This may be due to the presence of the international students and to multicultural differences. Writing consultancies are conducted as needed, nearly always by email, and may be initiated by students or instructor.

3. Integration of ICT

Online communication has gradually replaced traditional ways of communicating such information as assignments, notices, reminders, feedback, and conferencing. Email, which can be teacher- or student-initiated, is used for one-to-one and one-to-many communication. During the first course (Fall 2000), students were permitted to prepare transparencies and use the overhead projector while making their oral presentations because many were unfamiliar with Powerpoint. Since that time, however, all students have made Powerpoint presentations, as it has become a familiar tool used by them in their other courses.

Written assignments are sent as email attachments and feedback is provided electronically. Marking is done on-screen using the editing tool, the comment function, and a system of color-coding where different colors represent specific types of errors, denote that information is missing, and indicate that I have questioned what has been written. Examples of feedback received by students are presented in Figure 2. The editing tool, which appears in red on students’ papers, indicates suggestions for revision as well as errors that the instructor believes students will not be able to correct by themselves. Students may reject a suggestion for revision if they are able to provide a logical explanation for doing so. Possible reasons for rejecting suggestions for revision include a preference for their own “voice” and a feeling that the intended meaning has been changed. Errors that students are expected to correct by themselves, such as punctuation, spelling, upper/lower case, singular/plural, and subject-verb agreement, are marked in pink, while missing information that needs to be added is marked in blue. Green is reserved for questions and requests for clarification or further explanation. I try not to impinge on the role of the advisor/supervisor and thus comment on organization and content (lavender or comment function) only when it is a glaring problem; in other cases, organization- and content-related issues within various sections or chapters, and within the proposal or thesis as a whole, are left to the advisor/supervisor.

- Red = When consumed either as food or juice…
- Red = …to understand the Red Sea marine ecosystem in the context of investigating biological productivity…
- Pink = E.coli G35 strains has…
- Pink = …will be examined and than tested…
- Blue = Full lengths of TYLCV in pBluescript-labeled (something is missing) served as…
- Blue = At the second stage 4µl were transferred to a (something is missing) following PCR…
- Green = this non-oxidative enzymes… [The question, in green, to the student is: Do you mean ‘this enzyme’ or ‘these enzymes’?]
- Green = which corresponds somehow to the dimensionless analyses… [The question, in green, to the student is: Is this acceptable in engineering? Don’t you need to be more specific?]
- Lavender = Results of this study may suggest a broader hypothesis for further research related to semi-
nomadic herd raising. [The comment, in lavender, to the student is: This sentence is very general. You might want to wait until you have completed your study before making suggestions for further research. Hopefully, your suggestions will then be more specific. What does your advisor think?]

- Comment function = Leaf discs were sampled at different times from inoculation (24h -168h). [The comment appears in yellow; the student sees the following:]
  - The meaning is not clear. What are the differences in time? You need to rewrite this sentence.]

Figure 2: Examples of on-screen electronic feedback (Corrections made or errors to be corrected are in bold.)

When returning their revisions, students are expected to respond to my questions and comments. Some use the comment function and/or color-code their revisions, comments, and questions while others prefer to respond by email. In both cases, students communicate electronically. Writing consultancies are conducted almost entirely by email. When the course was first offered (Fall 2000), students met in individual tutorial sessions at least once a week. However, as the use of technology has become more effective and more efficient, face-to-face meetings have become extremely infrequent. On rare occasions, a student who has not understood my comments will print out the assignment with my comments and ask to meet with me personally for clarification.

HighLearn is a course management system used by most of the universities in Israeli since it supports a Hebrew and English interface. The HighLearn course-supporting Web site developed for the writing course enables the further integration of e-learning and e-delivery in the scientific/academic writing course. The principle features of HighLearn are listed in Figure 3. All materials previously photocopied by students, sent to them as email attachments, or distributed as hard copies in class are now available on the HighLearn site, under the heading 'Course Library'. The message board permits the posting of one-to-many notices while the assignment feature permits the separate listing of assignments and instructions for each class, which may differ as a result of the university calendar, as well as the listing of grades. Grades are listed separately for each class and posted anonymously by student identification numbers. They can also be listed under the Course Library. The forum feature, located under the heading 'Collaboration', is teacher-initiated; i.e. only the instructor is able to enter items for discussion. Participation in the forum is asynchronous, and a topic or question remains 'open' until deleted by the instructor. Students are able to view all entries and can decide whether to respond to a previous comment or to offer a "new" response that is not related to previous postings. Each reply to a specific comment is displayed hierarchically by means of indentation and chronologically. Another feature of the online forum is that student comments can be archived for analysis at a later time. HighLearn also enables teachers to verify how many students have actually viewed assignments and grades and to conduct polls and evaluations.

- Message board
- Course library (and grades)
- Collaboration (forums, bulletin boards, polls)
- Assignments (and grades)
- Directory (list of students registered for the course)
- Administration (access restricted to instructor)

Figure 3: Principle features of HighLearn

4. Teacher-initiated student evaluations

4.1 The evaluation form

Students complete an evaluation form at the end of each semester, usually after their final grade has been entered into the university computer system. The January 2005 version of the teacher-initiated evaluation form which reflects the format and content of the course as taught during the previous semester is presented in Figure 4. It is important to emphasize that the evaluation form is revised each semester to reflect changes in course content and course format. The present form will thus be revised in June 2005 to reflect the changes in forum discussion topics from teacher-initiated (Fall 2004) to student-initiated (Spring 2005).
1 Did you find the overall format (assignments and feedback sent by email, all material found on the HighLearn site) useful?
2 What changes would you make concerning the overall format?
3 Were the exercises that dealt with common language ‘problems’ useful, i.e. did you learn something from them?
4 Was the format of introducing the language ‘problem’ in class and then assigning exercises as homework acceptable or helpful? If not, what would you suggest as an alternative?
5 Was the reference material useful? Will this material be useful in the future?
6 Do you think students should give more than one oral presentation? Why or why not? (If your answer is affirmative, how many oral presentations should be required?)
7 Did participating in the Forum encourage you to share ideas, ask questions, raise problems, discuss homework, etc.? Why or why not?
8 HighLearn course-support site:
   a Is it useful to have material and information on the WEB?
   b Was the information (messages, assignments, grades, handouts, etc.) easy to access?
   c Is such a site preferable to email and attachments or is there no difference?
   d Other comments about HighLearn:
9 Which would you prefer concerning written material used in class?
   a The material should be distributed in class by the teacher.
   b The material should be sent by email as attachments for students to print.
   c The material should be on HighLearn for students to download and print.
10 What did you find most useful or most helpful?
11 What did you find least useful or least helpful?
12 Other comments and suggestions:

Figure 4: Teacher-initiated evaluation form

4.2 Analysis and discussion

Results of teacher-initiated evaluations indicate that students are satisfied with email communication and find it both effective and efficient (Questions 1 and 2) so that the traditional form of conferencing has in effect been replaced by asynchronous CMC. All students replied in the affirmative to Questions 3, 4, and 5, which dealt with presentation of common language problems, types of exercises, and reference material in the group sessions. Students who did not use the reference material during the course of the semester were certain it would be helpful to them in the future. While students agreed that it was important to prepare Powerpoint slides and present their research in English, especially since this was the only opportunity for some of them (those studying on the Beer-Sheva Campus) to do so, none of them thought it necessary to make more than one presentation (Question 6). Their reasons included the fact that this is a writing course and not a course in oral or presentation skills, that preparing a good presentation is time-consuming, and that they have to make presentations in their other courses.

No conclusions can be drawn regarding student responses to Questions 10 and 11 in which students were asked what they found most or least helpful and useful. The only clear pattern is that those Israeli students who were near-native speakers of English, i.e. had spent several years in an English-speaking country or international school, felt that anything remotely related to “grammar” was unnecessary, whether or not this was reflected in their writing. It is interesting to note that students from the Gambia, Zambia, Kenya, Ethiopia, and India did not make such comments. This may reflect cultural differences vis-à-vis acceptable behavior for students, i.e. whether or not perceived criticism of a lecturer is permissible.

Like the first two questions, Question 7, 8, and 9 refer to the technology-enhanced aspects of the writing course. In Question 7, students were asked whether participation in the Forum encouraged them to share ideas, ask questions, raise problems, discuss homework, etc. Student responses to the first part of the question indicated that the teacher-generated
topics, which focused on informal elements in research articles such as the use of imperatives, I/my/me/we/our/us, and direct questions, did not encourage student communication but merely passive responses to the teacher-directed questions. In other words, although students replied to the questions by referring to their specific areas of research, this did not lead to real communication or result in interaction between the students (Corich, Kinshuk, and Hunt 2004; Ho 2002). All of the students thought this type of forum participation was unnecessary and uninteresting and took too much time. They participated in the Forum only because 10% of the overall course grade was designated for this activity. This was true not only for students who participated actively in face-to-face conversation in the classroom but also for those who originally felt participation in asynchronous online discussions would enable them to practice what they perceived as ‘spoken’ English in a less-threatening atmosphere, i.e. those who were most quiet in class. The two groups of students can further be identified according to country of origin or cultural background. Students in the first group were from Israel, Europe and South and Central America while the others were from Asia and Africa. None of the students thought that asynchronous communication, whether teacher-initiated as in the

Forum or teacher-/student-initiated in email exchanges, could or should replace the weekly group sessions. Students stated that the “human element" is lacking in online communication. They felt that CMC is cold, impersonal, and unnatural, and that “real" learning takes place as a result of face-to-face student-teacher and student-student interaction in the classroom. These responses are also supported by Shetzer (1996), Susser (1993), and Warschauer (1996, 2001).

Nevertheless, it will be interesting to see whether students feel differently about the Forum discussions this semester since the topics, which were generated by their peers, focus on issues that are of interest to graduate students beyond the constraints of the classroom (Figure 5). According to Ho (2002), this in itself should motivate students to participate in online discussion of topics that encourage students to share knowledge or express diverse opinions. Preliminary results, based on this semester’s Forum participation, types of responses following explicit instruction prior to participation in the Forum, and student comments, appear to support research which indicates that when topics are relevant and interesting student participation increases (Funaro and Montell 1999). It has been noted that online discussion forums promote more egalitarian modes of discourse than face-to-face discussions since they offer time for critical reflection and analysis of peers' contributions in a non-threatening environment (Thomas 2002). This means that introverted students or students whose cultural backgrounds do not encourage overt participation in classroom-based discussions are able to express their opinions freely and to practice language in the impersonal setting of the online Forum. Participation in asynchronous online discussions may also lead students to acknowledge and even develop more complex perspectives on a topic.

Finally, asynchronous writing promotes more sustained interactions and greater syntactic complexity than synchronous writing (Sotillo 2000) since students are forced to write in such a way that others will understand and react to their thoughts and opinions.

- The role of rules in learning English
- Life after the MA/MSc/PhD
- Citing references you have not read
- Proving something "for sure"

Figure 5: Student-generated forum topics

The students, all of whom are familiar with technology, found the HighLearn site easy to access, once they were given a password and user name by the university (Question 8). All thought it was better to have everything on one site, rather than to receive email messages with attachments that were sometimes too large for their student email accounts. The international students especially liked having all the information and material on one site, and said they intended to save everything on a CD or DiscOnKey in order to take it home with them. This was preferable to having everything distributed in class; it was also more environmentally friendly, assuming students would not need to print out reference material in the future. There was no definitive answer to Question 9.
Although students preferred that material for class work be distributed by the teacher (immediate need), they also wanted the information to be available on HighLearn (future need).

The final question asks students for "other comments and suggestions". Here students noted that the course should be a year-long course, not a one-semester course, as there was too much to cover in a 12-14-week semester. Students also felt they should be given more than two points of credit since the amount of time spent on writing and revising was disproportionate to the amount of work required by other courses. All students appreciated the opportunity to improve their writing skills and the time spent by the instructor on each assignment. Students also stated that the integration of online communication in course format contributed to making the course personally relevant for them.

5. Conclusions and recommendations

5.1 Advantages of online communication

Online communication has been integrated into the scientific/academic writing course because I believe that computer-mediated interaction among students and with their instructor and other academics helps students become better writers (Warschauer 2002, 2004). One-on-one writing consultancies via email, on-screen marking using color-coding, the editing tool and comment function, and email submission of written assignments have proven to be more effective than the traditional paper submission and pen-and-pencil ‘correction’ of assignments permitted and used during the pilot course taught in 2000-2001. Furthermore, as noted by students in their course evaluations, integration of CMC in linguistically and culturally diverse writing classes contributes to satisfying students' demands for personal relevance. The integration of online forum discussions into the writing courses this year has provided students an opportunity to communicate with each other in an open, non-threatening, and 'faceless' environment about issues that are of interest to them, issues which would not have been discussed during the course. Because the Forum is asynchronous, students have time to think and organize their thoughts and ideas more clearly and persuasively.

It has been noted that without individual attention and sufficient feedback on errors, writing will not improve (Chandler 2003; Myles 2002). The effectiveness of feedback given also depends on student motivation, language level, and clarity of feedback (Myles 2002). Studies have indicated that most students have a positive attitude toward using computers for writing and communication, since this is something they do in the real world. When the computer and online communication are an integral part of a course, students have a feeling of personal empowerment as well as a sense of increased learning opportunities (Chen 1997; Susser 1993; Warschauer 1996, 2001, 2002, 2004).

CMC enables teachers to give learners sufficient, explicit and helpful feedback that is both personalized and at their level of proficiency. Chen (1997) found that personalized and accurate online feedback resulted in a reduction of error types and an increase in editing activity. In her study of types of error feedback in second language writing classes, Chandler (2003) demonstrated that teacher correction of errors (my use of the editing tool) and underlining with description (my use of pink for errors to be corrected by the student and green for questions, indicating that clarification or explanation or rewriting is needed) resulted in significant improvement in writing.

In theory, CMC enables prompt response by instructor and students. Feedback, including questions, replies, and comments of instructors and students, based primarily on acceptable usage and format in the professional literature of particular disciplines and/or sub-fields and on the preferences of advisors, who may or may not be native speakers of English, can be instantaneous. Online communication facilitates a higher degree of interaction than that found in traditional classrooms, where the usual pattern is teacher initiates, student responds, and teacher comments. It is a useful tool for the multicultural classroom, for students whose cultures traditionally expect behavior that is different from that found in
"Western" classrooms, because it enables these students to significantly increase their participation through e-mail communication and participation in online forum discussions. Finally, CMC enables teachers to personalize and individualize instruction and emphasize disciplinary-based genres, thus satisfying students' demands for personal relevance, in multilingual classes, multidisciplinary groups, and 'mixed' classes of Masters and PhD students.

5.2 Dilemmas

Despite the encouraging responses of students, problems and dilemmas still remain. The return rate of feedback is often too slow, since 25-30 students enroll in the two writing classes each semester. (In addition, the university requires that I teach an advanced-level reading comprehension course to 25-30 engineering students each semester.) Unfortunately, electronic discourse cannot solve the problem of too many students and lack of time. Research has shown that while on-screen marking and online communication are motivating, they are far more time consuming than traditional face-to-face teaching (Barker 2002; Warschauer 1996).

Dilemmas facing the foreign-language writing teacher relate to the extent and type of feedback students receive. Dangers include misinterpretation (Yates & Kenkel 2002) and too much correction, both of which may result in appropriating student writing so that the student's voice is no longer heard, having been replaced by the writing teacher's voice. I have attempted to solve this by not making suggestions for revision unless there are serious problems or errors, such as grammatical, syntactical and lexical mistakes, that interfere with or prevent comprehension. The distinction here is between "poor" English and "bad" English; the former is understandable while the latter is not. In addition, I ask questions when I am not sure what message or meaning the student wants to convey. Students appear to appreciate and learn from this since they are forced to consider what they have written and to make appropriate revisions (Chandler 2003; Zamel 1985). Because electronic communication differs from face-to-face exchanges (Barker 2002), teachers must also be careful when using CMC to communicate with students for such purposes as giving instructions, asking questions, offering alternatives, and drawing attention to problems.

Another question relates to whether or not teachers should participate in online discussions. Although student Forum postings were monitored and archived, no teacher intervention occurred during the online discussions as it was felt that teacher comments might be viewed as an intrusion, stifling rather than encouraging student communication. This semester's evaluation form will include a question in which students are asked whether or not they think the teacher should participate in the Forum in order to lead or encourage discussion, moderate content, and add pedagogical comments. During the Fall 2004 semester, one teacher-generated Forum topic was opened for three weeks. At the end of the third week, a second topic was posted, which also remained open for three weeks. This pattern was followed for the third topic as well. At the beginning of the Spring 2005 semester, however, students requested that the four topics be opened simultaneously for a period of two months. Students will also be asked whether they were satisfied with the simultaneous posting of topics or whether they would have preferred separate postings for shorter periods.

Although the writing course is delivered in a technology-enhanced or blended learning environment, students and instructor have continued to meet weekly in a traditional face-to-face setting. It is clear that the frontal sessions can be combined so that classes meet for a four-hour weekly session every other week, rather than every week for 1 1/2-2 hours. The question that arises, however, is whether fewer frontal sessions will have a negative effect on learning. Students will also be asked to consider this issue when completing the evaluation form at the end of the semester.

Two limitations of the HighLearn Web-based course support program used by BGU relate to the collaboration feature. The Forum is teacher-initiated, which means that students cannot pose questions or begin dialogue by themselves; rather, they must "wait" for the instructor to post a topic, even one that is student-generated. The second
limitation is that only one question or item can be listed under the evaluation (polls) feature, which is why the teacher-constructed course evaluation form appears under the heading 'Course Library'. A third limitation of HighLearn is that it does not permit synchronous discussion.

5.3 Recommendations

It is recommended that research be conducted on changes in the writing styles of participants as online discussions progress. The quality of student contributions should be analyzed and assessed for evidence of critical reflection and language that promotes interaction with other students. Although some work has been done on teacher intervention/mediation in online forum discussions, no definitive conclusions have been reached. It is hoped that further research will more clearly identify when teacher participation is desirable, what types of comments encourage student participation, and how students view such intervention or mediation. Plans for the further incorporation of new technologies into the graduate-level scientific/academic writing course include a HighLearn Internet Relay Chat (IRC) application to be installed by the university at a future date, which will enable synchronous communication initiated and directed by the instructor. It is hoped that students will one day be able to initiate dialogue via the ICR application so that participation in online discussion becomes more meaningful and relevant to them.

References


Hybrid Model for e-Learning at Virtual University of Pakistan

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Abstract: Virtual University of Pakistan uses hybrid model of education to impart knowledge to the knowledge seeker/students. This model has three basic components namely, physical campuses, lectures broadcast through television network and the mentoring and tutoring of students through the internet. This paper highlights in detail the working of this model and also indicates some issues that were encountered and solution proposed to overcome them.

Keywords: Hybrid Model, Moderated Discussion Board (MDB), Graded Moderated Discussion Board (GMDB), Private Virtual Campuses (PVC)

1. Introduction

By the end of 20th Century, most of the countries all over the world had jumped on the ICT wagon. Some achieved the heights of success while others kept struggling to make a niche for themselves. Pakistan being a progressive nation also took the challenge and started to concentrate on achieving good name in this arena.

However by the year 2000 it was becoming evident to the government of Pakistan that the targeted progress was not being achieved, the major problems identified for this deficiency were:
- Severe shortage of high quality faulty
- Scarcity of seats for the students in the higher education institutions
- High cost of higher education especially IT education
- Higher education institutes located in the urban areas
- Social factors that do not allow certain people to go to other cities

The need of the day was to produce a large number of educated forces within the shortest possible time. The government of Pakistan conducted a feasibility study and the report was presented to the United Nations Development Program’s Pakistan Office [Peter T. Knight, Naveed A. Malik, and Asim Iftikhar. 2000]. This report strongly recommended harnessing the power of Information Communication Technology and establishing Virtual IT University of Pakistan, which was later called the Virtual University of Pakistan. This study quickly converted into the project of ministry of science and technology. Pakistan

1.1 The primary concept

The concept of distance learning, e-learning and consequently virtual universities has already been used in many countries worldwide. For example University of Philippine Open University (UPOU) established in 1995 uses print, audio, video and online resources to deliver course material to the distance-learning students, and once a month they have tutorials on the learning campuses. The African Virtual University (AVU) established in 1997, use satellite television and Internet to deliver higher education all over Africa. It is working in collaboration with African Universities to identify the program needed for Africa’s development. Upon identifying the programs the AVU collaborate with best universities in the world to developing content and delivery through the network to African students.

The idea of AVU was inspirational and the government of Pakistan started looking at this model to see if they could customize it to their own regional needs.

As mentioned above Pakistan has been trying, for couple of decades, to generate niche for itself in the field of software engineering and computer science. For this reason several private institutes have been established to impart the IT education. These institutes have all the necessary infrastructure to impart distance education to e-learners, i.e. Computer laboratories, lecture rooms and internet services, and are located in the length and breadth of the country, hence it was decided to involve the private sector into this venture.
After the thorough study and analysis, the mode for imparting education was finalized. It was decided that Virtual University will locate and record the lectures delivered by the best faculty available in the country, and even abroad and broadcast these lectures on television network. The private sector partners of virtual university will be given a fair share to let the students utilize the facilities of computer laboratories, classrooms and internet. It will be mandatory for these private sector partners to provide television in each class room. These computer centers will be called the local campuses of virtual university or Private Virtual Campuses. Students from all over Pakistan will be enrolled into this university and they will go to their nearest virtual campus to receive education.

After listening to the lectures students will then go to the computer laboratories where they will connect to the universities online learning management system to get the contents of the lecture and interact with the teaching faculty.

There shall be one hub or head office of the university. At this place all the policies will be made, contents will be developed and telecast and the teaching faculty will be seated behind their workstations trying to educate the massive number of students.

1.2 Launching of the Virtual University of Pakistan (VU)

After the approval of the above-mentioned plan, the government of Pakistan released the funds of about 16 million dollars in November 2001 to launch virtual university of Pakistan. It was started as a project of ministry of science and technology, IT and telecommunication division, currently known as ministry of IT. It was decided that the university would officially start operating from the last week of March 2002. Thus the time provided to the team of Virtual University for developing the infrastructure and the preparation for the initiation was less than five months.

However during these five months the team of less than 15 people located the professors/consultants that would develop the course contents and deliver/record the lectures for the first semester. Private sector partners were contacted and those with best facilities available all over Pakistan were chosen as their local virtual campuses, or Private Virtual Campuses or PVCs. About 28 virtual campuses in 18 cities were established. The structure for the admission fees, university regulations and policies were devised. Private studios for recording and editing were contacted where the initial lectures were delivered. The Pakistan Television Corporation was approached to have a contract to deliver the recorded lecture on Air. The publicity campaign was launched to develop awareness about this new mode of education to the masses and the admission process was initiated.

After the seemingly unending and untriring efforts of the VU team, Virtual University of Pakistan was inaugurated on 23rd March 2002 by the President of Pakistan and its first lecture went on air on 2nd April 2002 with enrollment of 500 students from all over Pakistan.

This was a brief introduction to the inception and launching of the Virtual University of Pakistan. In this paper I will highlight the mode of communication and methodology used to deliver real education to virtually every nook and corner of the country and even abroad.

2. Mechanism of imparting knowledge

The model for the delivery of knowledge adopted by Virtual University is termed as Hybrid Model [Saima N. Sherazi 2001]. It is termed as hybrid because it utilizes:

- The facilities of class room and computer laboratories so that students get the chance to interact with each other
- The television network to deliver the recorded lectures to all the knowledge seekers within and beyond the geographical boundaries of the country.
- The Internet so that students can access the courseware and interact with the VU teaching staff.

Thus the model for the best delivery of education, through this mode, is in a triangular form as shown in the Fig-1 below.

We will discuss all the above-mentioned components of this model, i.e. Physical
Campuses/Private Virtual Campuses, Lectures delivered through TV and Tutoring through Internet. However point number 3, i.e. the tutoring through Internet will be explained in greater depth.

![Diagram of Hybrid mode of education](http://www.ejel.org/)

**Figure 1: Hybrid mode of education**

### 2.1 Physical campuses/private virtual campuses

It is important to discuss the role of the physical campuses/private virtual campuses in the overall educational requirement of the students. In order for the student to grow and become a useful member of the society he/she should be able to interact positively with its peers and elders. However, in the traditional e-learning model students interact with their teaching faculty as well as the other students through cyberspace. This mode of education is very useful, convenient and cost effective but due to the physical distance between its peers, the socializing aspect of the education is missed and later felt when these students have to work in the groups where people are physically present. Keeping this very important aspect of education in mind and the requirement that students need to study in their own hometown, as they have difficulty going to different cities, virtual campuses were opened.

These campuses have regular classrooms where students actually sit and listen to the broadcasted lectures. While listening to the lectures they note down the problem they come across its delivery. After the lecture they go to the computer labs where they interact with the teaching faculty through Internet, the course contents, assignments and all the supporting material is available for them on the Internet at the university learning management system.

By this process students discuss their problems, issues and difficult concepts with the students of the same campus, they do their projects and preparation of exams in the same manner as the students of conventional education system. Moreover, due to the Internet they also communicate with their classmates all over Pakistan.

Thus the first component of the Hybrid model prepares the students to enter into the professional life in the same way as students from any conventional education system. They will be confident and fully prepared to interact with their co-workers and seniors, and excel in a competitive and professional environment.

At the moment there are 118 campuses located in 62 cities of the country, where around 5000 students are receiving education. Following is the image of one of our physical campus.
2.2 Lecture delivered through television

Pakistan has acute shortage of qualified and experienced teaching personals. This is true not only for the field of information technology but also for the social science disciplines. The good faculty that we do have is concentrated in few major cities of the country. The small cities and rural areas devoid of the excellence in education. This creates a great divide in the quality of education with in the country. Thus to spread education of high quality to all corners of the country and to minimize this difference in the standard of education the second component of Hybrid model is used, i.e. Lectures delivered through TV.

Students of virtual university from all parts of the country listen to the lectures delivered by the same professor and thus get the same quality of knowledge. This is of key importance in building the educated nation.

Virtual University has its own television station and post production studios now, and broadcast the lectures over its two channels. The consultant professors design the course for the university and record their lectures for the television telecast. These lectures are also available on the CDs and VHS for the students and Private Virtual Campuses (PVCs). Following is a glimpse of the working at our television network:

2.3 Tutoring through internet

Since Virtual University is an e-learning university therefore the utilization of the Internet and its services is inevitable. Students use both Web and the emails to communicate with the teaching faculty and administration of the university. They access the contents of the courses and the supporting material over the Internet by logging into Virtual University’s learning management system software that is located on the server of Virtual University. And direct their day-to-day administrative issues through the email system.

Tutoring through Internet is the third and very important component in our Hybrid model for education. The platforms used to impart knowledge over Internet are Learning Management System and Email. I will discuss both these platforms but the learning management system will be discussed in greater detail.

2.3.1 Learning Management System

Learning Management Systems (LMS) paradigm as defined by Paris Avgeriou are “specialized Learning Technology Systems (IEEE LTSC, 2001a), based on the state-of-the-art Internet and WWW technologies in order to provide education and training following the open and distance learning”. Most learning management systems have three types of user. First type is the student, second type is the teachers/tutor and the third type of user is the administrator. Over the years it has been seen that for the best delivery of the courseware every learning management system should have the following features;

- The ability to include text, documents, files of many types including Office, audio, video, and images
- A grade book
- The ability to insert links of various resources, both internet and intranet
- A section for the FAQs

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• Discussion board
The VU-LMS has all the above features embedded in it. Every student has his/her account on LMS and can access its contents by entering the unique login ID and password. After logging into the system the student can see all the courses for which he/she has been enrolled as shown in the Fig-2 below.

Figure 2: Courses for the semester of students at VU-LMS
The student clicks on the course he/she wants to study and the new page is displayed. On this page the students can access the contents of the lectures, the assignments discussion boards and the most interesting feature the MODERATED discussion board. See Fig-3 below.

On the lecture content area the hyperlinks to the lecture notes, in the form of word document and HTML are placed. On each content area there is a hyperlink to the set of multiple-choice questions, labeled as pre assessment MCQs. After that there are hyperlinks to the contents or supporting documents for that lecture, these contents may be in the form of word document, HTML PowerPoint slides etc. After the hyperlinks to the contents there is another link to the MCQs termed as post assessment questions. The pre and post assessment questions are placed on the content area so that the students are able to assess their knowledge before and after the commencement of the lecture as shown in the Fig-3 below.

Figure 3: Contents area on VU-LMS
Another important feature in imparting education from the academic point of view is the process of assignments. I believe that assignments are very important mode of imparting education to the students as it force them to utilize their knowledge in solving various problems, and in return their efforts are assessed and graded. The VU-LMS has the facility to allow students to view the assignment statements given to them, see the marked assignments. i.e. the assignments are graded and commented by the teacher and are uploaded so that students may learn from their mistakes. They can also view the marks they score in each assignment as shown in the Fig-4 below, and see the general comments made about solution provided by the students. After the assignment’s due date, the teaching faculty, upload its solution on VU-LMS, so that students may learn the best possible way of solving the given problem.

Figure 4: LMS assignment page
Discussion Boards are another very important feature of the learning environment, be it the distance learning or the conventional mode of education. There are three types of discussion board available to the students on VU-LMS. In
the first type students interact freely with each other and discuss their problems without any intervention from the teaching staff. This gives them the freedom of thought.

The second type of discussion board is termed as moderated discussion board (MDB). On this discussion board students put there questions or concerns regarding the current lecture. And the teaching faculty responds to each question. The idea is to simulate the mode of classroom’s question answer session. Every lecture that is delivered through the television network has a corresponding MDB on VU-LMS. On this MDB student ask a question, this question is seen by all the students of the same class, irrespective of the geographical boundaries, and when a teacher responds and explains the concepts to the posted question, every one can see and get benefit instantly, thus it is equivalent to a conventional class room where students ask a question, every one hear it and when the teacher answers that question all the students who had the same problem but were shy to ask are benefited as well. An example of the MDB on VU-LMS is shown in the Fig-5 below.

Please note that for 3 credit hour courses there are 45 (1 hour duration each) lectures delivered on Television and thus there are at least 45 such discussion boards opened each semester.

The third type of discussion board is termed as Graded Moderated Discussion Board or GMDB. This is the extension of MDB. This is the equivalence of the class participation. Students are given a topic of discussion a week in advance and then are asked to come onto this GMDB for discussion. Each student participates in the discussion and the teaching staff grades his comments and material of discussion. The marks awarded are equivalent to giving the marks to the students for class participation. In this way students are encouraged to speak up and put their point of view in front of the whole class, which adds value to the education of the students. Example of the GMDB is shown below in Fig-6.

These MDBs and GMDBs are great resource or knowledge banks, based on these MDBs FAQs are developed and updated. This activity is generally performed after each semester. Further more there are hyperlinks to important sites and books available on the VU-LMS.
submission, or change of physical campus/PVCs, and late assignment submission etc. In order to cater these issues of the student virtual university has made email accounts for all relevant departments, for example, admission, exams, course selection, registrar, accounts, and for the course instructors of each subject. The most commonly used email accounts are those for the teachers of all the courses, academics, registrar, accounts and exams. However every student frequently e-mails their issues and sometime comments directly to the senior management, including the rector.

Thus the Hybrid Model of education practiced at Virtual University provide high quality education to students located all over the country, be it urban or rural areas, and provide them the necessary socializing aspect of the education.

3. Roles and responsibilities of the teaching staff

According to the teaching paradigm followed at the Virtual University of Pakistan, the best professor around the country are hired on contract to design the course content and record the lectures in the Virtual University television centre. Once these professors have developed the course material such as handouts, assignments and the midterm/final term exams and have recorded their lectures they are no longer associated with the University. In order to take this teaching process on and to deliver quality education to the students there are e-tutors or tutors present. As stated by [Sheena Bamks 2004] “In the Web based training, distance education and in most other forms of e-learning the teacher/tutor is very important, sometimes more important than in the traditional Education.”. This is very true; as for the students of distance e-learning institutes there is a marked divergence from the traditional face-to-face educational methods. The student no longer has the luxury to step into the professor’s room and get his/her points cleared, or the teacher of this educational mode cannot determine, during the recording of the lectures, if all the students will actually comprehend the point in question. Thus the responsibility of narrowing down this difference rests on the astute responses and knowledge of the tutors. It is the responsibility of the tutor to judge and analyze the problem that his/her student is asking, and present the most appropriate answer for it.

According to [Brigetti Denis 2004] the central role as linked to interaction between the e-tutors and the learner is Content Facilitator, Metacognition facilitator, Process facilitator, Advisor/Counselor, Assessor, technologist, resource provider. Furthermore the peripheral roles of e-tutor are listed as manager/administrator, designer, co-learner and researcher. The tutors at virtual university are fulfilling all the above mentioned responsibilities.. The specific tasks and responsibilities of these tutors/e-tutors include:

- To respond to each email that is received from the students: The queries that are generally asked by the student are about their low grades in the assignment, quiz, GMDB or exam and the pleas to allow the submission of late assignments. On average each tutor has to answer about 50 to 70 emails every week.

- To answer every question placed on the MDB: There are minimum 45 MDB forums, each corresponding to the lecture telecast on the TV. On every MDB there are on average 40 to 60 questions, the number of questions posted on MDB depends upon the number of students enrolled in the course. Apart from these 45 MDB forums there are at least two general MDBs, one before the mid term exam and the other before the final exam. These general MDBs are opened on VU-LMS to allow students to ask the question related to all the lectures they have studied so far and not just for one lecture.

- To grade each comment or discussion point posted on the Graded Moderated Discussion Board GMDB. The number of posting on the GMDB is also dependent on the number of students enrolled in the given course.

- To write and upload the assignments for their course on the LMS. There are on average 8 assignments per course. How ever in certain courses the number of assignments is more than 10.

- To mark all the assignments uploaded by the students: Every tutor has to identify the mistakes of the students in
the assignment and provide the comments for the better understanding of the student, and then send the assignment back to the student (on students VU-LMS account). On average about 300 assignments are marked by each tutor every week.

- To provide the solutions of the given assignments: Tutors also solve the given assignment themselves and upload it on VU-LMS so that students can learn from it.
- To prepare the quiz, upload it over VU-LMS, mark the quiz and display the result: The number of quiz marked depends upon the number of students in the given course.
- To provide the solutions of the given quiz: Tutors solve the given quiz then upload it on VU-LMS.
- To prepare the midterm and final examination question papers: On average tutors have to set three to four examination question papers per exam.
- To mark the answers of the midterm and final examination given by the students. The number of papers marked depends upon the number of students in a course, however on average, each tutor marks about 300 to 400 examination papers. The tutors also prepare the solutions of the examination questions.
- To upload and update the course contents on the LMS: Tutors regularly update the contents (lecture notes, FAQs etc.) of their course on the learning management system (VU-LMS).
- To update the handouts: For the better understanding of the course virtual university provide the handouts to the student. These handouts are printed on paper and delivered to students

Furthermore tutors are constantly devising ways to make their course more interesting for the students. For this purpose students are given challenging home works and course works. These course works are not graded but they develop interest of the student in the given subject.

The structure of the teaching staff is such that for every course offered, there is a team of tutors working diligently to conduct the course in a most effective and professional manner. For each team there is a senior tutor or team lead. The responsibility of the lead is to manage and guide his team members in responding to student's questions and queries and think of the ways to improve the standard and quality of course contents.

It is to be noted that the number of tutors in a course is directly proportional to the number of students enrolled in that particular course. The prescribed ratio is one tutor per 300 students. Hence if the number of students enrolled are less than 300 than one tutor takes care of the course.

At the moment Virtual University is offering BS in 12 disciplines. For each discipline there will be a senior faculty member termed as assistant professor. The main responsibility of this senior faculty will be to manage all the courses under his/her domain. i.e. for BS computer science, this senior faculty will manage all courses related to the field of computer science.

4. The basic problems faced by the tutors and the students of VU

The hybrid mode of education is new and unique in this region. Thus there are neither any set rules nor processes yet defined, implemented and tested, that may directly be incorporated into Virtual University. Hence the team of VU is learning as it moves on. There are great achievements to its credit but the path to success is not without difficulties. There are several problems that the, students as well as the teaching faculty faces. The nature of problem ranges from administrative to academic to broadcasting. However here i will highlight the academic issues and problems faced by both students and teachers.

The students have reported following problems through emails, telephone calls and by visiting the Virtual University Head Quarter:

- It is difficult to adjust to the class room without the actual presence of the teacher
- The mode of education and communication at VU-LMS is through English language (lectures broadcast are, however bilingual); this language is not the first language of the Pakistani citizen. Hence at the
beginning they find it difficult to ask questions and queries through internet using English language.

- Since there are no one physically present to solve problems related to the course lectures, especially in the field of mathematics as the concepts of mathematics are quite complicated and difficult to explain via recorded lectures and internet, it is hard to understand the contents.

The problems faced by the teaching faculty are as under:

- Tutors are new to this mode of education delivery and thus they initially find difficult to adjust and respond to queries. Mostly it has been observed that tutors think they can explain a concept in a better fashion had the student been physically present there.

- In the case of Assignments, some students tend to copy another student's work, however it is not possible at the moment to determine who solved the questions first, and awards no marks for it. Thus tutor feels that due to the distance they are some time not able to educate students to the fullest.

- Since the mode of instruction is in English, Students are generally not able to put their questions properly, thus it is difficult to respond to the students.

- It is difficult to explain complicated mathematical concepts through MDBs and email.

- Students generally provide excuses for not submitting assignments on time. The teacher has no way to verify his claims.

The team of virtual university under the guidance of the rector Dr. Naveed A. Malik is constantly evolving new ways to breach this gap between students and teachers.

The idea of teaching assistant has been introduced at VU to cater the above-mentioned issue. Initially 39 teaching assistants are appointed in various physical campuses all over the country so that they can coach their juniors.

Further more it is under consideration to utilize the television broadcast, and take important questions from students (email, phone call etc..) and provide answers to them on live telecast session called tutorial sessions.

5. Summary

In order to educate the Pakistani nation in the minimum time, government of Pakistan adopted the Hybrid model of knowledge transfer. Hybrid model of education involves the broadcasting medium such as television, the Internet and the physical campuses where the students are actually seated to receive education. The professors that are rated as the best ones in their field deliver the lecture through television broadcast. The teaching faculties that actually interact with the students are available over the Internet, and respond to student's issues and problems through the email and the learning management system placed on VU server. The learning management system has the course contents, FAQ, resources and links available. The best mode of communication on learning management system (VU-LMS) is the Moderated Discussion Board (MDB). The tutors or e-tutors play the pivotal role in imparting education to the nation. They are mentors, guide and problem solvers for their students. However since the concept of this mode of education is entirely new to this region there are certain issues and problems but the team is constantly seeking the solutions and removing the problems.

Reference


Sherazi S N. and Ikram M J [2001] “A Hybrid Distance Education Model For Pakistan”
Using Data Mining for e-Learning Decision Making

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Abstract: The initial investigation aimed to examine the paths learners followed when offered the course in a custom virtual learning environment (VLE) which is structured by tasks, course materials and learning resources. However, it quickly became clear that students were spending little time with the course materials online and the time spent with each page was usually less than 20 seconds. Consequently a better understanding of how learners accessed the electronic course materials was needed to evaluate the effectiveness of developing and delivering courses in this way.

By combining data on the activity with content with user profiles it was possible to examine alternate information perspectives and reveal patterns in large volume data sets. Mining data in this way provides ways to learn about learners in order to make effective decisions regarding teaching methods, delivery models and infrastructure investment.

1. Background

The University of Glamorgan’s e-College Wales (ECW) project is a European Social Fund (ESF) project aimed at delivering online courses in entrepreneurial business management to learners who would not normally attend a traditional on-campus University course. It is one of the largest e-learning projects in Europe.

ECW adopted a standard virtual learning environment from a recognised vendor. Its choice (Blackboard™) was sufficient for administration of courses and students but it was felt that its presentation of learning materials was not able to support the developing online pedagogy. Not wanting the project to be technology driven, the decision was made to continue to use Blackboard for course management and providing discussion forums but that delivery of course content would be via a separate web service which could be adapted to meet learner needs.

However, the lack of activity-based reporting from this bespoke solution has left it unclear whether the technology is meeting the needs of the learner. This document details the development of tools which import, store, query and report learner activity in the bespoke content delivery platform and is designed to provide decision makers and course developers with an understanding of what e-learners need from e-learning technology.

2. Introduction

“To use the opportunities provided by the Internet, there is an obvious need for the design of learning environments which use the interactive capabilities to the best advantage and are not merely the transformation of print-based material to online delivery.” (McDonald and Reushle 2001) 

The study examined the activity logs of 345 part-time and full-time e-learning students, from business MA, BA and Foundation degrees at seven partner institutions, over an 8-week period. Analysis was conducted on student activity by course, institution and age group, and examined the specific use of the VLE’s print page by both student and staff. In addition, students were surveyed on their reading and printing tendencies, supply of print materials from tutors and students’ preferred medium of delivery for course materials.

The key findings showed that 80% of all users accumulated less than one hour a week with the course materials in the VLE, and around two-thirds of all users acquired less than 30 minutes a week. Most looked at large portions of their content for less than 20 seconds and tended to have a low average page view. It also found that over 75% of learners were obtaining print versions either themselves or directly from tutors. The students surveyed raised a number of important points regarding studying online and how they use text-
based materials with the web-based environment.

There is a risk that the adoption of e-learning can become technology driven and the need to achieve a return on investment detracts from the evaluation of the benefit to the learner of this medium. It has been suggested that web-based learning environments have a psychological and physical cost as they "may impact learning achievement due to cognitive overload caused by processing too much information from multiple resources within a very short time and due to visions problems caused by spending long time reading materials from computer screens." (Chang 2003)

The change of emphasis from getting the learner online and 'into' the technology to understanding the learners' needs and using the appropriate medium for the learning materials is considered a factor in successful delivery as "many distance education planners argue that replacing technology-driven models with a learner-focused, outcome-based 'blended-technology' distance education model will result in increased learner satisfaction and increased attainment of learning objectives by students." (Howard 2001) This view is supported further when considering that the second most important criteria for evaluating quality in e-learning is that it has 'clearly explicit pedagogical design principles appropriate to learner type, needs and context' (Massey 2002).

Consequently an understanding of the learner's use of this medium is essential in evaluating the benefit of the technological investments, establishing a sound pedagogy based on learner needs and ensuring the quality of the learning experience. Indeed both the evaluation of student performance and student evaluations of the learning experience are considered elements in the definition of quality with which to ensure distance education meets its goal of 'developing independent learners who can capably apply their knowledge to new situations' (Cavanaugh 2002).

In Karen Rosa's survey determining the preferred choice of course materials presentation for distance learners, it is suggested that distance learners did not wish to obtain their course materials via the internet. Participants were asked to give their first, second, and third choice for course materials supplied: as printed material, electronic files, or via internet access.

**Table 1: Preferred choice of course materials (Rosa 1999)**

<table>
<thead>
<tr>
<th>Group</th>
<th>Print</th>
<th>Electronic file</th>
<th>Internet</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBA students</td>
<td>45.5%</td>
<td>36.4%</td>
<td>18.2%</td>
</tr>
<tr>
<td>MDE students</td>
<td>68%</td>
<td>20%</td>
<td>12%</td>
</tr>
<tr>
<td>Comp students</td>
<td>44.8%</td>
<td>44.8%</td>
<td>10.3%</td>
</tr>
<tr>
<td>HD group (do not belong to one of the other groups)</td>
<td>47.3%</td>
<td>28.2%</td>
<td>25.6%</td>
</tr>
</tbody>
</table>

This is supported by the fact that students rarely read web pages but simply scan for individual words and sentences (Neilson 1997). The editorial team in e-College Wales was aware of the differences between print and online presentation of text and had adopted guidelines for writing for the web which can be summarised by the following list (Juniper 2002).

- Keep the lines short. The flickering background of a computer monitor makes reading more difficult, so each line should not be longer than 10-13 words.
- Short paragraphs of 150 words or fewer help ensure readers stay on task.
- Make ample use of headers, sub-headers and bulleted lists.
- Use the active voice rather than the passive
- When appropriate, use different media such as images, animation, audio and video intermixed with the text.

### 3. Approach

There are a number of products which enable statistical analysis of web sites from server logs, but these tend to be geared around enterprise information such as return visitors, how often they return, and most popular pages. The University's marketing department is currently implementing the product Web Trends and an initial test was run on a sample log file. The standard overall views were again present and although customisation of reports was a possibility. The project's programmers believed they could produce the desired reports direct from the source data.
3.1 Definition of the source data

The content delivery service is via Microsoft Internet Information Services web server, which for a number of different log formats but had been storing its logs in the NCSA Common Log File Format which carried the following information:

<table>
<thead>
<tr>
<th>remote host name</th>
<th>172.21.13.45</th>
</tr>
</thead>
<tbody>
<tr>
<td>user name</td>
<td>REMONDAfred</td>
</tr>
<tr>
<td>date &amp; time</td>
<td>08/ Apr/1997:17:39:04 -0800</td>
</tr>
<tr>
<td>Requested page</td>
<td>&quot;GET /scripts/is/admin/isn.dll/http/serv HTTP/1.0&quot;</td>
</tr>
<tr>
<td>HTTP status code</td>
<td>200</td>
</tr>
<tr>
<td>number of bytes sent</td>
<td>3401</td>
</tr>
</tbody>
</table>

More detail and flexibility in selection of appropriate recorded information is available with the W3C Extended Log format:

<table>
<thead>
<tr>
<th>date &amp; time</th>
<th>15/11/2002 04:35:19</th>
</tr>
</thead>
<tbody>
<tr>
<td>clients IP</td>
<td>217.143.40.248</td>
</tr>
<tr>
<td>clients username</td>
<td>02084562</td>
</tr>
<tr>
<td>server Port</td>
<td>80</td>
</tr>
<tr>
<td>request method</td>
<td>GET</td>
</tr>
<tr>
<td>page requested</td>
<td>/applications/interface2/index.asp</td>
</tr>
<tr>
<td>any query parameters</td>
<td>modulecode=eb1s04</td>
</tr>
<tr>
<td>HTTP status code</td>
<td>200</td>
</tr>
<tr>
<td>Clients Browser and Operating system</td>
<td>Mozilla/4.0 (compatible; MSIE=6.0; Windows +NT+5.0; .NET+CLR+1.1.4322)</td>
</tr>
<tr>
<td>Number of bytes sent</td>
<td>141</td>
</tr>
</tbody>
</table>

The server records every request made by a user and stores it in text files writing one file for each day. To enable analysis of the log file data, these text files were imported into Microsoft SQL Server using a Data Transformation Service (DTS) script. All of the NCSA text files covering the period 15 November 2002 to 23 February 2004 and W3C Extended files from 23 February 2004 to 1 March 2004 were imported using the DTS packages which selected each attribute in the log record and then stored into the appropriate field in the database table. A total of 3,440,837 records were imported covering the period midnight on 15 February 2002 to 23:58 on 1 March 2004. As a result of the DTS script, subsequent daily imports are now achievable.

3.2 Method of analysis

The custom VLE comprises a number of dynamic Active Server Pages (ASPs), a frameset, style sheet, and GUI graphics. The course content is offered via three views: materials, tasks and library resources, with additional pages for guidance and assistance. The design came from the developing pedagogy which aimed to enable learners to choose alternate paths through the course. For example, one perspective was content
driven with the learner being instructed to complete tasks at relevant points in the course materials:

**Materials view**

Another view gave assignment information and a list of the tasks to support completion of the assignment. Each task directed the learner back to a relevant topic in the course materials.

**Tasks view**

The third view allowed learners to see additional electronic resources, e-journals and gateways to websites for each topic area, enabling the learner to research the subject.

**Resources view**
As the log files contain every single request made by a user, some work was required in order to extract useful information from the data. A process of filtering out via SQL queries helped remove much of the ‘noise’ and a view was created that only displayed request for ‘valued’ pages as listed in Table 4:

<table>
<thead>
<tr>
<th>Table 4: Breakdown of pages in database view</th>
</tr>
</thead>
<tbody>
<tr>
<td>Opening the custom VLE</td>
</tr>
<tr>
<td>Content pages and files from multimedia directories (not images for the GUI)</td>
</tr>
<tr>
<td>Tasks and assignments</td>
</tr>
<tr>
<td>References, required reading, suggested reading, web sites and PDF documents</td>
</tr>
<tr>
<td>One to one tutorial tool (only deployed in 1 module)</td>
</tr>
<tr>
<td>User assistance</td>
</tr>
<tr>
<td>Specific use of VLE’s printing function (does not record printing via the browser)</td>
</tr>
</tbody>
</table>

These records were grouped by username and ordered by date, effectively giving the page-by-page record of the learner’s path through the course materials. A web interface was written to enter search
criteria of username, start date and end
date for the search period, and type of
activity as illustrated in Table 5:

Table 5  Example Student Log

<table>
<thead>
<tr>
<th>Study Log for 02083868</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>date</td>
<td>query</td>
</tr>
<tr>
<td>10/02/2003 15:44:20</td>
<td>/application/interface3/index.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:44:21</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:44:21</td>
<td>/application/interface3/white%20list.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:44:21</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:45:01</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:45:15</td>
<td>/application/interface3/printoptions.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:45:38</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:46:08</td>
<td>/application/interface3/printoptions.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:46:28</td>
<td>/application/interface3/printoptions.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:47:45</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:47:49</td>
<td>/application/interface3/printoptions.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:51:50</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:51:50</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:51:50</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:53:10</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:55:54</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:56:01</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:56:04</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:56:04</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:56:14</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
<tr>
<td>10/02/2003 15:56:19</td>
<td>/application/interface3/extras.asp modulecode=e1402</td>
</tr>
</tbody>
</table>

The difference between the time of a page request and the time of the previous page enabled the calculation of the time spent on a page. It was this figure that was of most interest as random samples indicated that even when many pages were requested the actual time spent in the VLE was low.

The report was summarised to calculate the accumulated time spent online in the course materials, a count of each browser session started, the number of pages per browser session. From this it was possible to report the usage patterns based on the quantity of pages that were viewed for less than 20 seconds. The 20-second threshold was used to indicate printing or skimming, based on the guide page length set by the editorial team, as would be difficult to read and comprehend the text and any multimedia in that time. The example in Table 6 shows an average page rate of 2.3 pages per minute and just over half the content being viewed for less than 20 seconds.

Table 6  Example usage summary

<table>
<thead>
<tr>
<th>Usage Summary</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Search Period:</td>
<td>17 weeks</td>
</tr>
<tr>
<td>Total time in VLE:</td>
<td>7 hrs 1min</td>
</tr>
<tr>
<td>Total browser sessions:</td>
<td>50</td>
</tr>
<tr>
<td>Total pages requested:</td>
<td>958 pages</td>
</tr>
<tr>
<td>Average Page Rate:</td>
<td>2.3 per min</td>
</tr>
<tr>
<td>Total page views less than 20 secs:</td>
<td>491 pages</td>
</tr>
<tr>
<td>% of views less than 20 secs:</td>
<td>51%</td>
</tr>
<tr>
<td>Average page view:</td>
<td>26 secs</td>
</tr>
</tbody>
</table>

Further queries of the data banded students into ranges based on the accumulated time spent online, the percentage of pages which were viewed for less than 20 seconds and their average page view time during a period of a week. The results are listed in Table 7:
Most users spent less than one hour obtaining content from the VLE. About one-third of the users had an average page view of less than 20 seconds. These analyses support the hypothesis that the majority of users spend little time with the materials in their electronic format.

Further query of the data reveals that over 3 months, on average 39% of users had spent less than 30 minutes a month with the material in its electronic format.

### Table 7 Report of weekly user trends

<table>
<thead>
<tr>
<th>Time</th>
<th>Users</th>
<th>Time with materials (% of users)</th>
<th>Content pages read for less than 20 seconds (% of users)</th>
<th>Average page view (% of users)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>&lt;30 min</td>
<td>&lt;3000 key</td>
<td>&gt;3000 key</td>
</tr>
<tr>
<td>4-12 Oct</td>
<td>115</td>
<td>22.50</td>
<td>12.00</td>
<td>67.50</td>
</tr>
<tr>
<td>13-20 Oct</td>
<td>115</td>
<td>22.50</td>
<td>12.00</td>
<td>67.50</td>
</tr>
<tr>
<td>21-28 Oct</td>
<td>113</td>
<td>22.50</td>
<td>12.00</td>
<td>67.50</td>
</tr>
<tr>
<td>29-Oct to 4 Nov</td>
<td>112</td>
<td>22.50</td>
<td>12.00</td>
<td>67.50</td>
</tr>
<tr>
<td>5-11 Nov</td>
<td>116</td>
<td>22.50</td>
<td>12.00</td>
<td>67.50</td>
</tr>
<tr>
<td>12-18 Nov</td>
<td>114</td>
<td>22.50</td>
<td>12.00</td>
<td>67.50</td>
</tr>
<tr>
<td>19-25 Nov</td>
<td>110</td>
<td>22.50</td>
<td>12.00</td>
<td>67.50</td>
</tr>
<tr>
<td>26-Nov to 2 Dec</td>
<td>108</td>
<td>22.50</td>
<td>12.00</td>
<td>67.50</td>
</tr>
<tr>
<td>3-9 Dec</td>
<td>118</td>
<td>22.50</td>
<td>12.00</td>
<td>67.50</td>
</tr>
<tr>
<td>10-16 Dec</td>
<td>117</td>
<td>22.50</td>
<td>12.00</td>
<td>67.50</td>
</tr>
<tr>
<td>17-23 Dec</td>
<td>114</td>
<td>22.50</td>
<td>12.00</td>
<td>67.50</td>
</tr>
<tr>
<td>24-Dec to 1 Jan</td>
<td>111</td>
<td>22.50</td>
<td>12.00</td>
<td>67.50</td>
</tr>
<tr>
<td>2-8 Jan</td>
<td>116</td>
<td>22.50</td>
<td>12.00</td>
<td>67.50</td>
</tr>
</tbody>
</table>

3.2.1 Deviation by exiting students

It was thought that students who had withdrawn or deferred could be affecting the balance of the spread under ‘Time with materials’ as they would stop accumulating time after they ceased study. To check the extent of this possible deviation, the Student MIS database for the total number of students exiting was queried again filtering out all users who had an enrolment status of ‘withdrawn’ or ‘deferred’.

The user sample was significantly reduced, however it was found that there was no significant change in the trends. Consequently withdrawn/deferred students were not filtered from further queries, thus maximising the sample.
3.3 Analysis by user profile
To identify whether there were different types of activity depending on course, age or institution the activity data from the server logs was related to the student MIS database which contained demographic, application and enrolment information. The original sample of 659 students (of which 549 had server logs) was reduced to 335 student records that each held a date of birth and course enrolment details. Of these 304 had server logs.

The ECW project delivers a number of awards at different levels of study: masters, undergraduate and foundation degrees to seven institutions across Wales. The data was analysed on the view of course, institution and age by the three perspectives of percentage of content viewed for less than 20 seconds, average page view and time in the VLE.

The analysis of users by course, institution and age indicated that the accumulated time in the VLE, the percentage of pages viewed for less than 20 seconds and the average page view are reflective of the patterns in the overall usage. Therefore the conclusion would be that there is no significant difference in the use of the VLE in terms of course studied, institution attended or age of the student.

3.4 Use of print-page options
The VLE enables the users to select which page they wish to print. While previous statistics only indicate the time elapsed between the requests for pages this analysis gives a clear indication of users who make specific requests to print:

Table 9 Print requests

<table>
<thead>
<tr>
<th>6-12 Oct</th>
<th>13-19 Oct</th>
<th>20-26 Oct</th>
<th>27/05-2</th>
<th>30 May</th>
<th>1-7 June</th>
<th>8-14 June</th>
<th>15-Jul Sep</th>
<th>20-30 Aug</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>36</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>40</td>
<td>38</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>35</td>
<td>29</td>
<td>6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>35</td>
<td>29</td>
<td>4</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>46</td>
<td>37</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>46</td>
<td>37</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>47</td>
<td>40</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>65</td>
<td>52</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>52</td>
<td>44</td>
<td>3</td>
<td>4</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>51</td>
<td>44</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

The total number of print-option users each week raised questions over the usability and overall value of this functionality in the VLE. While most print fewer than 25 pages a week using this method, there is a small group of users who print a large number of pages in this way.

An examination of users printing more than 25 pages per week reveals that they were a mixture of both students and staff. Across a seven-week period, 31 students records were returned:

Table 10 Student print activity

<table>
<thead>
<tr>
<th>Total</th>
<th>%</th>
<th>Course</th>
<th>Total</th>
<th>%</th>
<th>College</th>
</tr>
</thead>
<tbody>
<tr>
<td>23</td>
<td>74.1</td>
<td>MAED</td>
<td>22</td>
<td>70.9</td>
<td>Glamorgan</td>
</tr>
<tr>
<td>3</td>
<td>9.6</td>
<td>BA Enterprise</td>
<td>4</td>
<td>12.9</td>
<td>Coleg Sir Gar</td>
</tr>
<tr>
<td>5</td>
<td>16.1</td>
<td>Foundation Business Administration</td>
<td>4</td>
<td>12.9</td>
<td>Coleg Gwent</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>3.2</td>
<td>Llandrillo</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

As illustrated earlier in Table 11, Glamorgan had a much larger share of the students.

The print option was used by 31 students compared with the 334 students in the page view sample. A high proportion of students who used this print facility are enrolled on the MAPD, even though they are only 18% of the overall number in the study. Similarly, BA Enterprise students were not proportional, with less than 10% using print although they comprise 42% of the overall sample.

This may be due to the different sample sizes, however, an examination of the staff use of this facility suggests another reason why there is a discrepancy in these numbers. The results indicated that staff from the BA Enterprise at Glamorgan and Coleg Sir Gar were the main users of the print options page method of printing and that four out of these nine staff members printed more than 100 pages from the VLE.
during the eight-week period of analysis, and we shall see later that many staff were supplying students with printed copies of course material.

3.4.1 Table 11 Staff printing usage: 6 October – 23 November

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>drobert3</td>
<td>Coleg Sir Gar</td>
</tr>
<tr>
<td>36</td>
<td>alknasek</td>
<td>Coleg Gwent</td>
</tr>
<tr>
<td>50</td>
<td>sabbott</td>
<td>LRC Staff</td>
</tr>
<tr>
<td>53</td>
<td>djamess</td>
<td>Coleg Sir Gar</td>
</tr>
<tr>
<td>75</td>
<td>wjones1</td>
<td>Uni of Glam</td>
</tr>
<tr>
<td>110</td>
<td>jwilliam</td>
<td>Coleg Sir Gar</td>
</tr>
<tr>
<td>110</td>
<td>ppergrit</td>
<td>Uni of Glam</td>
</tr>
<tr>
<td>122</td>
<td>cewans2</td>
<td>Coleg Sir Gar</td>
</tr>
<tr>
<td>250</td>
<td>ggeorge</td>
<td>Pontypridd College</td>
</tr>
</tbody>
</table>

3.4.2 Reasons for staff printing

When interviewed, a Coleg Sir Gar tutor explained that the printing was done in order to supply on request a hard copy of the materials to students. Two reasons were put forward: firstly the poor internet connections in that geographic area; secondly, the desire for the materials to be in front of the learner when completing the online tasks. This raised some questions about the usability of the structure of VLE which was designed to allow a switch between tasks, materials and resources windows without losing 'place'.

Another tutor, from Coleg Gwent, said that they printed a copy of the materials, had it bound and sent to all students. The reasons being that reading is difficult on screen, online display is not best suited for the reflective learning style, and poor internet connections.

4. Student preferences

Much of what has been learned so far has been based on interpreting the data generated by activity on the web server. To understand more about e-learners' behaviour, they were surveyed electronically: firstly about their reading and printing patterns, including whether they received printed copies from tutors; secondly, about their preference for delivery (similar to the survey of Rosa, 1999); and finally to gain any further feedback.

Section 1 used option boxes to indicate level of activity. Error checking was used to ensure data was collected.

Section 2 used a radio box matrix to rank choices. Error checking was used to ensure only one first, one second and one third choice was made.

2. Preferred delivery of course materials

Rank the course materials format in order of your preference:

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1st choice</td>
<td>2nd choice</td>
<td>3rd choice</td>
</tr>
<tr>
<td>Materials accessed in Blackboard</td>
<td>Electronic files sent to you</td>
<td>Printed material sent to you</td>
</tr>
</tbody>
</table>

Finally a multi-line text box allowed students to provide additional comments; these provided some interesting points which will be discussed later.

3. Any other comments you would like to make about the online course materials:

The sample of active students was contacted by e-mail linking them directly to a web-based form. The results were collected in the SQL server database and keyed by enrolment number. The enrolment number was then use to join the data to the student profile, eg age, award, college etc. Out of the 553 users in the
sample, 145 responded. The breakdown of students was as follows:

Table 12 Sample distribution by course

<table>
<thead>
<tr>
<th>Course</th>
<th>Sample</th>
<th>Responded</th>
<th>% Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Associate Student Scheme</td>
<td>69</td>
<td>1</td>
<td>1.5%</td>
</tr>
<tr>
<td>BA Enterprise Award</td>
<td>215</td>
<td>88</td>
<td>41%</td>
</tr>
<tr>
<td>Foundation Business Administration</td>
<td>95</td>
<td>11</td>
<td>12%</td>
</tr>
<tr>
<td>MA Professional Development</td>
<td>173</td>
<td>43</td>
<td>25%</td>
</tr>
<tr>
<td>Combined Studies</td>
<td>1</td>
<td>1</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 13 Sample distribution by age

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Sample</th>
<th>Responded</th>
<th>% Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 25</td>
<td>51</td>
<td>15</td>
<td>30%</td>
</tr>
<tr>
<td>25 - 35</td>
<td>152</td>
<td>40</td>
<td>26%</td>
</tr>
<tr>
<td>35 - 45</td>
<td>191</td>
<td>51</td>
<td>27%</td>
</tr>
<tr>
<td>45 plus</td>
<td>135</td>
<td>35</td>
<td>26%</td>
</tr>
</tbody>
</table>

Table 14 Sample distribution by institution

<table>
<thead>
<tr>
<th>Institution</th>
<th>Sample</th>
<th>Responded</th>
<th>% Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bridgend College</td>
<td>31</td>
<td>7</td>
<td>23%</td>
</tr>
<tr>
<td>Coleg Gwent</td>
<td>36</td>
<td>9</td>
<td>25%</td>
</tr>
<tr>
<td>Coleg Sir Car</td>
<td>123</td>
<td>39</td>
<td>24%</td>
</tr>
<tr>
<td>Llandrillo College</td>
<td>33</td>
<td>5</td>
<td>15%</td>
</tr>
<tr>
<td>Pembrokeshire College</td>
<td>20</td>
<td>3</td>
<td>15%</td>
</tr>
<tr>
<td>Pontypridd College</td>
<td>14</td>
<td>0</td>
<td>0%</td>
</tr>
<tr>
<td>University of Glamorgan</td>
<td>296</td>
<td>91</td>
<td>31%</td>
</tr>
</tbody>
</table>

The low response from the Associated Scheme is because students achieve accreditation for this scheme if they withdraw from the BA Enterprise but have passed the induction training. The high response from the combined studies is due to there being only one student in this category. A similar response rate was gained from each age group.

The lower response from Llandrillo, Pembroke and Pontypridd Colleges is reflective of the low or no time spent with the materials electronically in the VLE. However, there was no clear reason for low responses from Foundation and MAPD students.

The initial findings show that only a quarter always read online, with almost half never or only sometimes reading online. Similarly, just over half always or regularly printed

Table 15 Student reading and printing activity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Always</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student reads online</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>Regularly</td>
<td>28%</td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>43%</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>3%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Always</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student prints</td>
<td>36%</td>
<td></td>
</tr>
<tr>
<td>Regularly</td>
<td>23%</td>
<td></td>
</tr>
<tr>
<td>Sometimes</td>
<td>33%</td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>8%</td>
<td></td>
</tr>
</tbody>
</table>

Looking at online reading and use of print version by age group indicates that proportionally there was little difference between age groups as far as online reading; although over-45s seemed unlikely to ‘never’ read online, the sample was too small to be clear.
Almost 40% of e-learners were supplied with a print version of the content by their tutor. The distribution of this activity was fairly similar between the BA and Foundation degrees with around half never receiving a print version. In comparison, two-thirds of the MAPD students never received a print version.

An analysis of which institutions were supplying printed versions reveals Coleg Gwent, Coleg Sir Gar and the University of Glamorgan supplied of their learners with printed versions on request. In addition, Coleg Sir Gar supplied most of its students with a printed copy of each module.
Combining the view of users who either printed regularly, always, or their tutor supplied a copy reveals that 77% of the users accessed a printed version of the materials.

The online reading pattern of this group of learners shows over half read online ‘sometimes’ and almost half ‘regularly’ or ‘always’. This is a similar pattern to the overall reading trend with more of a bias towards only reading online ‘sometimes’.

**Table 16** Reading pattern of learners who obtained printed versions

<table>
<thead>
<tr>
<th>Reads online and has print copy</th>
<th>Always</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regularly</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Sometimes</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>Never</td>
<td>4</td>
</tr>
</tbody>
</table>

In terms of learners who obtained print copies, the spread was fairly consistent at around the 80% mark with the under-25s being slightly less inclined to read online ‘regularly’ or ‘always’.

**Table 17** Age distribution of learners who obtained printed versions.

<table>
<thead>
<tr>
<th>Age</th>
<th>Responded</th>
<th>Obtain</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>under 25</td>
<td>15</td>
<td>10</td>
<td>67</td>
</tr>
<tr>
<td>25 - 35</td>
<td>40</td>
<td>30</td>
<td>75</td>
</tr>
<tr>
<td>35 - 45</td>
<td>51</td>
<td>39</td>
<td>75</td>
</tr>
<tr>
<td>plus 45</td>
<td>35</td>
<td>31</td>
<td>89</td>
</tr>
</tbody>
</table>

The first choice preference for delivery of materials of the overall sample shows that almost 2/3 of students prefer a web delivery as first choice while over a quarter would prefer a printed copy sent to them.

**Table 18** First choice delivery preference

<table>
<thead>
<tr>
<th>Web</th>
<th>86</th>
<th>60 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic file sent</td>
<td>18</td>
<td>13 %</td>
</tr>
<tr>
<td>Printed copy sent</td>
<td>40</td>
<td>28 %</td>
</tr>
</tbody>
</table>

The first choice preference of those students who either printed ‘regularly’, ‘always’, or whose tutor supplied a copy reflects a similar pattern. This is expected as 77% of users were in this group, the only change being a slight shift away from the preference for web delivery towards print.

**Table 19** First choice delivery preference of users who obtained a print version

<table>
<thead>
<tr>
<th>Web</th>
<th>64</th>
<th>58 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electronic file sent</td>
<td>14</td>
<td>13 %</td>
</tr>
<tr>
<td>Printed copy sent</td>
<td>33</td>
<td>30 %</td>
</tr>
</tbody>
</table>

The distribution of first choice preferences for the delivery of materials across age groups continued the pattern with twice as many requesting a web delivery over print.

**Table 20** First choice preferences for the delivery of materials (across age groups)
The distribution of first choice preferences for the delivery of materials across awards again saw twice as many BA Enterprise students requesting a web delivery rather than print. However, a larger proportion of MA Professional Development students preferred the web. Only slightly more of the Foundation students requested web delivery as first choice but this was a significantly smaller sample and therefore may not be as representative.

### Table 21 First choice preferences for the delivery of materials (across awards)

<table>
<thead>
<tr>
<th>Age</th>
<th>1st choice print</th>
<th>1st choice web</th>
<th>1st choice electronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>under 25</td>
<td>4</td>
<td>9</td>
<td>2</td>
</tr>
<tr>
<td>25 - 35</td>
<td>12</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td>35 - 45</td>
<td>14</td>
<td>29</td>
<td>8</td>
</tr>
<tr>
<td>plus 45</td>
<td>10</td>
<td>21</td>
<td>4</td>
</tr>
</tbody>
</table>

4.1 Students’ comments regarding printed materials

In addition to the statistical data, students were offered the opportunity to add comments. Feedback was given by 82 students, of which 45 gave some comment on the choice on printed materials. These comments can be grouped in to the following areas:

#### 4.1.1 Reasons regarding access, eg:

Printed material is very useful when Blackboard is down or unavailable for maintenance.

Links are often very good however larger files take some time to download I would prefer these to be printed for me.

I can't always access the materials through Blackboard so printed materials are best.

You cannot access a computer everywhere but you can a book.

Because you are accessing the materials alone, you always have a slight concern that you have failed to find all the relevant material.

#### 4.1.2 Reading preferences, eg:

It is easier to read print information [than on screen] when there is a lot of it.

I find that the current materials are very hard to read in a continuous flow, mainly due to the subdivision into many individual pages.

I prefer to read 'Hard Copies' as I find that by physically reading the notes I am able to highlight sections of material, and spread out many pages on my desk, which can then be cross-referenced with text books, etc.

The animations are great but not practical to print out the work to take away with you ... end up having to print each frame individually.... could they be put up in a comic book format with all frames visible at same time?

#### 4.1.3 Making notes, revision, assignments, eg:

I find I don't take in all the information, however if I have a printed copy along side the keyboard I make additional notes.

I always read the material online, but I also print off a copy so that I can read through offline when preparing for assignments.

Difficult to see the whole picture when accessing individual pages and unable to annotate with your own notes.

The first two years I did not print off material and used screen only. Third year printed material is helpful for revision.
4.1.4 Combination of print and electronic, eg:

Ideally a combination of access via Blackboard and printed materials sent out. Core text books plus online materials works very well

Although I prefer to have a hard copy in front of me when I'm studying, the online course material is also very useful, especially the Flash illustrations which paint a picture better than words.

With electronic files and Blackboard I can choose what to print out

4.1.5 Time cost concerns, eg:

I have to print everything as I don't have the time to spend sat in front of the computer.

Make it easier to run off printed copy it's time consuming in the current format

I use a great of paper & ink to print out the course materials, I feel I must print it out so that I may keep referring to it when I need to, I also file in order and keep it in book form, this is expensive

From these comments it is possible to see that students have concerns over accessing and reading internet pages because of practical reasons such as eye strain, portability and the process of developing understanding by adding notes. Others make the suggestion that a combination of online and print would benefit learners while some raise the need to make it easier to obtain print versions and to reduce cost.

4.2 Other comments from students

Other comments made by students can be grouped into three main areas as follows:

4.2.1 Navigation and access, eg:

Would be better if it was made easier to get around and more user friendly. It took a while for me to get used to it. I know that some students still can't use it properly.

I think it is set out superbly as it is very easy to follow, can't think of any improvements which could be made

Would be really helpful to have more of the references for main and sub topics linked or available pdf files

Accessing discussion groups is very long winded - takes about 7-8 mouse clicks/screens to eventually get there. Very frustrating especially for each module!

4.2.2 Course design (academic), eg:

At the beginning of the course I felt the need to have the course materials up at all times but now I'm more confident they are read once then I look elsewhere [for additional information].

The way they are set out makes them easy to read.

I think the way they are is fine except I would prefer if each stage of the course materials for each module would outline what part of the assignment it relates to and also what tasks each part relates to.

Please get more e-books!

For the reading list for this module (change), there seemed to be more traditional books / articles listed than material available by e-learning. This is not what I would have expected - I do not have the opportunity to always come to a central LRC

The info in course materials, whilst user friendly, is vague.

4.2.3 Enjoyment, eg:

I found the course rather interesting, a lot better that I had anticipated, I did have my doubts at first about doing an online course, but it was rather enjoyable.

It's great and I enjoy doing it. It's very challenging

Excellent materials

Detailed information, references, etc which enhances other literature.

Very well structured

CPD course materials very good, useful and informative. Links are easy to use. Found experience very enjoyable, when time has permitted

Again the issue of access occurs and the issues raised here highlight the fact that the internet delivery can be difficult to navigate, the book perhaps being a more familiar provider for information for some. Others made specific comments regarding the way in which courses were set up and delivered while another group simply conveyed their satisfaction.
5. Conclusions

5.1 Time in the VLE

The findings indicate that 80% of users accumulate less than one hour a week with the course materials in the VLE with around two-thirds of all users acquiring less than 30 minutes. Analysis of users by course, age and college revealed a similar pattern.

5.2 Amount of content viewed for less than 20 seconds

Around 50% of the users viewed three-quarters or more of their content for less than 20 seconds and around 40% of users between half and three-quarters of their content for less than 20 seconds. Analysis of users by course, age and college revealed a similar pattern.

5.3 Average page view time

Around a third of users had an average page view of less than 20 seconds with around a quarter averaging between 20 and 39 seconds. No significant difference between groups of age, college, award or deviation by withdrawals.

5.4 Staff printing

Viewing evidence from both sets of data indicates that staff are printing and supplying over a third of students with printed versions of the materials and that this practice occurs mainly at Coleg Sir Gar and the University of Glamorgan.

5.5 Student preferences

While almost half of the students ‘never’ or only ‘sometimes’ read online, just over half ‘always’ or ‘regularly’ printed and 77% obtaining print either themselves or from the tutor. It appears that there is a distinct need for e-learners to have a printed version of the learning materials. However, twice as many learners expressed a preference for the delivery of learning materials via the web rather than over print, and age did not appear to be a factor in this pattern.

5.6 Student feedback

Feedback from students indicated that there are a number of concerns over accessing and reading internet pages because of practical reasons such as eye strain, portability, navigation and the process of developing understanding by adding notes. Others make the suggestion that a combination of online and print would benefit learners while some raise the need to make it easier to obtain print versions and to reduce cost. A small group simply conveyed a positive satisfaction with the online learning experience.

6. Recommendations

6.1 Understand and use the appropriate medium

E-learning at e-College Wales is driven by its pedagogy rather than by technology. However, as this research shows, there needs to be a review of the way technology is used in e-learning specifically to understand and address the relationship between electronic delivery and printed text. Elearners.com defines e-learning as incorporating a number of technologies (audio, video, data and print), stating that ‘Textbooks, Study Guides, Workbooks - Are still very common in online learning courses’ The inclusion of print as a valid e-learning technology suggests that it does best what it is designed to present, the written word. However, if electronic technology does not support the written word as well as print then there needs to be a better understanding of what this medium is best used for, eg collaboration, discussion, simulation, testing, tutoring, guidance and feedback.

The student-student interaction is key to Vygotsky’s belief that “students learn from viewpoints of others in order to build a more complex worldview” and to Piaget’s view that knowledge could be built or “constructed” on learner’s prior experiences and knowledge and that peer-to-peer collaboration was more valuable than adult-to-child discussion (Conrad R.M., Donaldson J.A, 2004).

The suggestion that learners benefit more from being actively participating in the learning process, constructing understanding from their own knowledge acquisition and through student-student discussion lends constructivism as an appropriate pedagogical model for online study where online activity, independent researching and discussions between students plays an important part of asynchronous learning.
Innovations in this area are emerging with IMS Learning Design specification which moves away from describing and packaging content structures and focuses on learning activities which can use services such as chat, discussion and collaboration as well as content to achieve the learning outcome. Software vendors such as Learning Activity Management System, Blackboard™ and WebCT™ are already adopting learning design principles in response to the needs of the learning community. The shift from structuring courses around content to learning-outcome-based activities enables course developers to make the learning objectives transparent for the student and make decisions about the types of resources which can enable an e-learner to achieve them.

By removing the content-driven structure and forming an activity-based development process based on learning outcomes, e-College Wales's course developers could identify methods of learning appropriate for electronic medium where text-based material was only one option. This is in contrast to creating an 'online book' which encourages printing and offline reading. The output of this would be via the development of a VLE which conveys the learning structure and actively engages the student in the learning experience.

6.2 Understand and respond to learner needs

Overall it seems that the low use of the materials in their electronic format is largely accountable by the 77% of learners who are making use of printed versions. However, twice as many learners indicated a preference for web delivery over print. Perhaps then there is difference between the choice of medium for reading and the method of delivery. Interestingly enough only a small proportion would prefer an electronic file sent to them so this area of thought still requires some investigation to understand in what ways students prefer their learning materials to be delivered and which type of materials best suit which format. The e-learners' preference for web access but with a distinct need to read from print suggests a re-evaluation of how the two elements of access and use relate to each other.

For e-learning to truly meet the needs of online students, course developers must get to know the students and establish quickly their likely needs by building learner profiles.

6.3 Construct knowledge from composite information sources

The study has shown that no one single piece of information can confirm exactly how students use the VLE. However, it has shown that by combining multiple information perspectives from multiple experiences it is possible to reveal patterns which can suggest tendency for one thing over another. By translating the raw data into an information structure which can be looked at from different perspectives it is possible to start constructing knowledge about learners and the learning process which is essential for organisational decision making.

For this to work effectively, the learner profile should extend beyond mere preferences for reading materials or even simple demographics and should include special needs, deferral history, IT competency and their particular learning needs: “how they prefer to study, what they want from study, their long term goals”.

These learner profiles can be related to products or services such as Learning Resource Centre, tutorials, lectures, counselling, online resources, by activity logs such as attendance, assessment grades, library loans, helpdesk calls. This composite information model (see illustration) could be used to reveal patterns of activity for analysis.
Analysis from this information model could be used to answer questions at 3 levels and provide the valuable evidence needed to inform the course development process and delivery models as suggested in Table 25.

**Table 22 Example Feedback at 3 levels**

<table>
<thead>
<tr>
<th>Student</th>
<th>How am I performing?</th>
<th>Which areas do I need to improve to get my grade?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tutor</td>
<td>Which of my students require support?</td>
<td>What teaching methods are more effective for these students?</td>
</tr>
<tr>
<td>Organisation</td>
<td>Do international students require a different support structure?</td>
<td>What’s the most cost effective way of improving retention and grades?</td>
</tr>
</tbody>
</table>

**References**


iv Quality and e-learning in Europe, summary report 2002 Jane Massey, European e-Learning consultant & analyst


ix http://www.w3.org/TR/WD-logfile


xi Conrad R.M., Donaldson J.A., Engaging the Online Learner, Activities and Resources for Creative Instruction, Jossey-Bass 2004, pg 4
