

# **Usability Testing Report for the WebCT Learning Environment of CS1022B**

**– A part of Encouraging Deep Learning with E-learning project**

Conducted by

Fang Liu

Commissioned by

Dr Willem-Paul Brinkman & Dr Andrew Rae

**School of Information Systems, Computing and Mathematics, Brunel  
University, Uxbridge, Middlesex, UB8 3PH, UK**

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## **Abstract**

Although the Virtual Learning Environment (VLE) is considered as an alternative means which makes Higher Education more effective and flexible than before, there is still a pressing need to address the issue of how the teaching strategies and technology could be aligned successfully to support students' learning. Here the main objective of "Encouraging Deep Learning with E-learning" project is to investigate a series of problems including VLE related issues which influences students in applying deep learning strategy as well as the usability problems.

The usability testing is a part of the project of "Encouraging Deep Learning with E-learning" investigated by Dr Willem-Paul Brinkman and Dr Andrew Rae. Its objective of this usability testing was to examine the existing usability problems and weaknesses in the usage of a web-based VLE (here refers to the WebCT environment) that is heavily supported by video materials. This testing contains eight user cases which focused on examining the usability issues of learning materials, the module-related contents and the design of the WebCT environment for CS1022B. The main learning materials and items investigated in these tests were Study Guide, Lecture Slides, Course Videos, Learning Instructions for module 1 learning unit 1, Self-test, Progress Overview, Discussion Board, and Exam Papers etc. The testing results were collected from three sources: the tasks performed by eight participants, the interviews and questionnaires.

According to those findings, the overall impression for the WebCT learning environment of CS1022B was rather easy and flexible to use, especially the course videos are useful and supportive for validating the exercise solutions and help the students understand the concepts, theories and reinforce learning, the self-test was also quite easy to use and the automatic feedback of the test was considered handy and convenient. However, the participants experienced many difficulties which has caused huge frustration in learning when using the WebCT, those difficulties include the unclear presentation of the learning instructions and visibility problems, the inconsistent design of the course materials and site design, lack of constructive and progressive structure of the navigation tools and unclear status of the functions in course videos etc. This report also presented the suggestions from the participants along with the main findings stated above.

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This report mainly presents the usability problems identified during the eight user usability tests of the WebCT learning environment accompanied with the recommendations from eight participants. The following sections describe the details of this usability testing which covers the brief of the project, the objectives of the project, the objectives of this usability testing, the main procedure of the tests conducted, and the testing results respectively.

## **1. Brief of the project**

With a large number of the students enrolled in the higher education with a diverse background, it is believed that the Virtual Learning Environment (VLE), such as WebCT, could enable students to study in an effective and flexible pattern at their preferred and convenient time and place. However, the question of how to design an effective web-based E-learning environment supported by video materials to support learning remains unanswered. This proposed project mainly deals with establishing a framework (including a set of guidelines and the VLE itself) that can be adopted in the design of web-based learning environment based on the digital video materials to deliver the teaching and learning effectively and efficiently, therefore, the two main areas: teaching strategy and the VLE (here refers to the WebCT) will be investigated and studied deeply. It is expected that the framework could assist other teachers to improve their teaching via WebCT, and more importantly to provide an ease-to-use and effective learning environment for a large number of students with a diverse background involved in the particular modules.

## **2. Objectives of the project**

The aim of this project is to establish a framework for the virtual learning environment (VLE) that is heavily supported by the video materials which encourages the students to adopt a strategy of deep learning approach. Therefore, the objectives are as follows:

- To identify the VLE related factors which encourage and discourage the students to apply the deep learning approach
- To discover the current usability problems in the usage of the web-based VLE by conducting the usability testing
- To make improvements in the VLE based on the usability testing findings
- To evaluate the effectiveness of the improvements made

## **3. Objective of the usability testing**

The objective of this study fits into one of the project objectives stated above, it is to identify usability problems and current weaknesses in the usage of the web-based learning system and thereby to gain a better understanding of how a web-based Virtual Learning Environment (WebCT) heavily supported by video materials can be designed to support effective learning.

Studying the usability problems are crucial to the success of web-based E-learning environment as the main interest of the usability is to design a computer-based system with the attributes of easy-to-learn, easy-to-use, flexible, and pleasant to use etc. Therefore, this new pattern of learning compared to traditional classroom learning would be able to address the problems related to the different learning needs of students from diverse backgrounds and enable the learning more convenient and flexible.

## **4. Main procedure of the usability testing**

A total of 8 users were recruited during the user tests starting from Wed 28<sup>th</sup> Jul 2004 to Mon 2<sup>nd</sup> Aug 2004. A pilot testing was conducted before these eight formal testing cases, so the data from that session are not included in the following data analysis. The pilot testing was to try out those equipment and facilities, test the design of experiment sessions including materials used, methods of collecting data, and timing of the sessions etc.

### **4.1 Participants**

The group of users who have participated in this evaluation is a subpopulation of the intended population. The subpopulation consists of Brunel MSc students from various academic backgrounds (excluding Computer Science or those similar subject areas such as mathematics, programming, statistics, or information systems etc.). These students have never taken the module CS1022B as well as have no or little knowledge about the basic Propositional Logic Theories e.g. the Statements, the Connectives ‘AND’, ‘OR’ and ‘NOT’ etc. They all have the adequate computing skills and Internet experience. Half of the participants are novices to the WebCT learning environment, and the rest of them just had some basic experiences of using the WebCT e.g. checking general course information. In addition, all the students have no experiences of other similar web based learning systems.

### **4.2 Procedure**

Once the pilot testing was proved to be feasible and effective, user tests were carried out subsequently.

This usability testing was conducted in DISC Usability Lab room 3 and 4 (located in Pinking Building). It was done in one-to-one session. The following is the procedure of a typical session of this testing.

First of all, the observer individually briefed the participant with the objectives of this experiment, main procedure taken in the testing, particular experiment rule i.e. applying think-aloud rule, and other module-related or WebCT-related questions and so on. After the user consented to proceed, the user needed to carry out five tasks which are related to the first level of the module CS1022B – module 1 learning unit 1. Users needed to do those tasks in the order given and finish one task before proceeding to the next. The tasks are supplied in full in Appendix A.

Users were required to apply think-aloud rule to speak aloud their thoughts, ideas, feelings and activities currently performed or to be performed while they were carrying out those tasks.

Secondly, after the five tasks were completed, the users were given a short informal interview to provide their ideas and comments. The short interview forms with questions concerning the learning of first level module of CS1022B via WebCT environment are provided in Appendix B.

Lastly, the students were required to fill in a questionnaire regarding the perceived ease-of-use and satisfaction of this learning (module 1 learning unit 1 of CS1022B). The questionnaire contains a list of six different course-related learning materials or tools, i.e. study guide, lecture

slides, course videos, self test, progress overview and discussion board. Please refer to Appendix C for further details.

In summary, this experiment was designed to capture the participants' general reaction and activities for the purpose of finding usability issues of the WebCT learning system of CS1022B. These reactions were then elaborated in the interview carried out subsequently. And the duration of a test was averagely around 2 hours.

#### **4.3 Data collection**

During the whole procedure of performing the tasks, all the participants' verbal outputs were taped by a microcassette recorder with the users' permission. In the meantime, the observer was taking notes which acted as a type of bookmarks which were used when the author are performing the data analysis. The interviews were also taped complemented with a manual recording, which would be easier for transcribing and analysing the data in the later stage.

### **5. Testing results**

Having executed the action plan formulated in the Procedure and Data Collection section in the previous section, a group of findings was obtained. In this section, the results acquired from user trials were collected and presented. Those results were derived from three sources: the tasks performed by participants, the interviews and questionnaires. Mainly the results are organised into two subsections: findings from the tasks performed and interviews, and findings from the questionnaires.

#### **5.1 Findings from the tasks performed and interviews**

In this section, these results are generally divided into two classifications: the difficulties with the module contents or the module-related materials, and the design problems of the WebCT learning environment for CS1022B.

The following lists a series of major issues raised during the usability testing which are represented under the two different categories stated above. The full details of observation records and interview notes from the eight participants are supplied at Appendices D and E. The following findings are described in the form of the problems identified as well as the suggestions from the participants.

##### **5.1.1 The difficulties with the module contents and other module-related materials:**

###### **1. Study guide**

*(Problems identified)*

*Major problem(s):*

- It is too long with too much information (participant 1, 2, 4, 6).

*(Suggestions from participants)*

- List a few bullet points instead of the long paragraphs (participant 4).

**2. Lecture slides**

*(Problems identified)*

*Minor problem(s):*

- Flaw in the presentation style – there is a bit delay between two bullet points shown on the same slide, this may be useful for the lecturer to do the presentation, but may not be good for the students to do the review (participant 3).

*(Suggestions from participants)*

- Flexibility – provide a few links in the lecture slides to enable the students to access other related materials (participant 7).

**3. Written learning material for module 1 learning unit 1**

*(Problems identified)*

*Major problem(s):*

- Unclear design of study materials – hard to find the learning materials or instructions online due to the confusion about the contents and differences between the learning instruction and the lecture slides (participant 1, 2, 7).
- The online written learning material is not easy to use (participant 5).
- Unclear presentation of the learning material and visibility problems – the exercises in the written learning material are not well-presented so therefore some of them are misunderstood, hard to be found or even missed, e.g. Keisler’s problem was understood as one of the exercises rather than an example – it needs to add a headline for those exercises (participant 1, 3, 4, 5, 6, 7).
- System consistency – the whole representation is not consistent, the different exercises are displayed in the different styles e.g. some are presented in the box, but others don’t (participant 5).
- Lack of users’ understanding – the symbols used in the written material along the left side are not understandable or not noticeable, e.g. the “book”, “video” and “pen” symbols (participant 2, 3, 6, 7, 8).
- Overall structure – the written instruction was not well-organised and the learning is frustrating (participant 1, 3, 4).

*Minor problem(s):*

- Other – difficult to understand the word “but” compared to other Connectives in the written material (participant 4).



*(Suggestions from participants)*

- It could be organized into two parts: first presented with the module topics or instructions, second is the exercises (participant 3, 5).
- The answers to those exercises could also be supplied in the learning instruction materials or on the web so it can be checked easily and quickly (participant 3, 5).
- In the written instruction, those symbols denoted “book” and “video” could be placed inside the paragraph instead of on the left side margin so it will be more noticeable (participant 7).

#### **4. Videos**

It's good that videos provide the alternative ways to solve the problems (participant 1).

*(Problems identified)*

*Minor problem(s):*

- The speed is a little slow (participant 3).
- The speed is a bit fast – e.g. it may be hard to reflect the questions during the intervals (participant 4).
- The image is less professional (participant 6).

*(Suggestions from participants)*

- Could have some delay between two exercises shown in the video so the students may have some extra time to think of the problems (participant 4).
- Better to show the lecturer's face in the videos so the students could contact with him/her if they need any help at the later stage (participant 2).
- Provide more videos for supporting learning, e.g. the whole lecture/instruction videos, not only for checking the answers of the exercises – then it'll be easier to understand the module content; and also convenient to access the lectures if the students missed the lectures (participant 1, 3).
- The process of checking answers via video is time-consuming – this system could supply the answers to the exercises with the explanations right on the web rather than in the video, it is quite handy to validate the answers when sometimes the students are lack of the time (participant 3, 5).

#### **5. Self-test**

*(Problems identified)*

*Major problem(s):*

- Too simple with less questions (participant 1, 2, 5).

***Minor problem(s):***

- The results review is not understandable and pleasant to use e.g. the arrow icons and the percentage shown in the tables (participant 4).

***(Suggestions from participants)***

- Could have more questions in the test (participant 1).

**6. Progress overview**

***(Problems identified)***

***Major problem(s):***

- Not sure about the exact meaning of “progress” and not very clear why need such a progress overview (participant 1, 3, 8).
- Interpreted “progress” as the results of the exams, qualifications or a summary record of the assignments, courseworks, and exams (participant 7, 8).

**5.1.2 The design problems of the WebCT learning environment for CS1022B:**

The problems presented here in the sequence of overall organisation of the whole site, the left-side navigation tool, home page and individual course-related items.

➤ **Overall organisation**

***(Problems identified)***

***Major problem(s):***

- Inefficiency of using system – quite a few tools in this site are not very easy to learn and pleasant to use (participant 2, 3).
- The overall structure of this site is not well-presented (participant 2, 3, 4, 6, 7).

***(Suggestions from participants)***

- The whole structure of the site should be designed better and clearer (participant 1, 4).
- There’s no interaction between the learning materials and the students (participant 2).
- Add some interactive functions and create an attractive site with nice appearance (participant 2).
- Site personalization (participant 6).
- If the information shown on one page is too long, then it’s nice to split it into different pages supplied with a “hybrid structure” or some flexible navigation tools e.g. “previous” and “next” functions to access the intended pages easily, it is suggested not

to use the scroll bar as it could prevent the students from exploring the site (participant 7).

➤ **The left-side navigation bar**

*(Problems identified)*

*Major problem(s):*

- Presentation and organization – the left-side navigation bar is confusing and the structure is not well-organized (participant 1, 3, 4, 7).
- Lack of constructive and progressive structure – the structure of different labels at the left side is not well-presented (participant 1, 3, 7).
- Untidy design – it has too much information, it is too cluttered and difficult to find what I want (participant 2, 3, 6).
- Visibility of system status – the font size is pretty small, not suitable and noticeable (participant 1, 2, 6, 7).

*(Suggestions from participants)*

- Categorize the left side bar into different topics, but provide the details when clicking on those main topics (participant 1, 3).
- The menus or links should change the colours to present different status, so the users will know which ones they have visited or they are currently visiting (participant 2).
- The left side bar could be sorted to an alphabetical order which may be easier to access (participant 5).
- The left side navigation tool could have a type of collapsed level similar to the Windows directory (participant 7).
- This site should have a really supportive help function which can be referred to when the users get stuck (participant 1 – however he did not go through the “help” function during the testing).

➤ **Home page**

*(Problems identified)*

*Major problem(s):*

- Lack of the essential and necessary information on homepage e.g. the course background information, the main objectives of the course, the module leader and lectures’ contact information etc. (participant 4, 5, 8).

- Repetitive design – there are some replicated tools with same functionalities provided on both left side bar and the homepage, thus it increased the complicity e.g. Communication (participant 3, 7).
- Mismatch between the system and the common rules – the items in the home page are not designed in the right order – “Communication” usually should be the last item, not the first (participant 4).

***Minor problem(s):***

- Last two icons/image symbols in the home page are not distinguishable (participant 6).

***(Suggestions from participants)***

- Home page should highlight those important functions and information (participant 4).
- It would be more informative if home page can provide the closely-related information about this curriculum, such as the main aim, the module leader, and the module leader’s contact information etc. (participant 4, 5, 6).
- Home page could also include other important information, e.g. the contact details of the lecturers or other staff (participant 5, 8), past exam papers etc. (participant 8).

## **1. Study guide**

***(Problems identified)***

***Major problem(s):***

- System efficiency and partially failed function – the pop-up window is quite annoying when opening the study guide (participant 1, 3, 7).

***(Suggestions from participants)***

- The study guide can be displayed in a separate web page or in a PDF file rather than in a DOC format (participant 8).

## **2. Lecture slides**

***(Problems identified)***

***Major problem(s):***

- System efficiency and partially failed function – the pop-up windows are disturbing when opening the lecture slides, and the slides page could not be open properly sometimes (participant 1, 2, 3, 7).

***(Suggestions from participants)***

- It would be more convenient if some information described in the study guide could be provided in the lecture slides with a few links by which it can take the users to the intended contents (participant 7).

- Name the slides links properly e.g. “Lecture one – Aim & Background information” (participant 7).

### **3. Videos**

#### ***(Problems identified)***

##### ***Major problem(s):***

- Difficulty of locating the videos in the WebCT environment and poor organization of the video page (participant 5, 6).
- Unclear status of system functions – inside the video player window, those icons or tools along the bottom are not easy to understand (participant 3, 5, 6, 8).
- System efficiency and partially failed functions – the maximum function at the upper right corner of the video player window doesn’t work (participant 5).
- System efficiency – video screen is shown quite smaller when it is opened initially, and it is very hard to make it large afterwards (participant 5).

##### ***(Suggestions from participants)***

- Should supply a text prompt e.g. tooltips for those functions or buttons in the video window (participant 3, 5).

### **4. Self-test**

#### ***(Problems identified)***

##### ***Major problem(s):***

- Self-test is not clearly defined, students are confused with self-test and diagnostic test (participant 1, 6, 8).
- Representation and organization – the self-test is not observable (participant 4, 8).
- System organization and presentation – the information on the “Begin Quiz” page was usually easily ignored (participant 2, 7, 8).
- Status of the items and options – the type of the options in the self test is not well-defined, e.g. whether the question is a single-choice question or a multiple-choice one (participant 3, 4, 6, 8).
- Mismatch between system status and users interpretation – it is hard to understand what’s shown in the results review, e.g. those arrows displayed in the review, and the meanings of the percentage. It’s not pleasant to use (participant 4).
- Visibility – the “Question Status” table at the right side is not noticeable (participant 3).

- The first page shown after clicking on “self tests” is very confusing, it contains lots of information that is not understandable (participant 7).
- Repetitive function – e.g. same information can be found from the dropdown menu and the list displayed at the same page (participant 7).
- Status and organization of system options - Don’t understand the options displayed in the dropdown menu, such as “All quizzes and surveys that are available” (participant 7, 8).

***(Suggestions from participants)***

- The first page in the “self tests” should just provide the alternative way of presenting the information, e.g. either a dropdown menu or a list of tests (participant 7).
- The instruction information of the self test should be placed at the beginning of the page, before the button “Begin Quiz” (participant 7).
- The students could be required to complete the self test within a certain amount of time (participant 2).

**5. Progress overview**

***(Problems identified)***

***Major problem(s):***

- The progress overview is not essential, it looks very confusing and not understandable, it seems like just for the designers not for the students (participant 3, 6, 8).

***(Suggestions from participants)***

- Probably could merge the two items “grade” and “progress” (participant 8).

**6. Communication, particularly discussion board**

***(Problems identified)***

***Major problem(s):***

- System status and information presentation – it’s not noticeable, and hard to find the intended contact information on the site (participant 1).
- The discussion board is usually not the first choice to the students. (participant 1, 3).
- Quite a few participants prefer email rather than discussion board (participant 3, 4, 5, 7).
- The course email and discussion board look confusing (participant 5), and not well-understood by many participants, the function and basic difference between email and discussion board are not clear to the users (participant 3, 5, 6).

*(Suggestions from participants)*

- Better to provide a web form which can be used to contact with the lecturer straightaway by filling a form with some questions, it's quicker and handy (participant 2).
- It should be nice if it can display which message is new and which has been sent in the discussion (participant 3).
- Should have the detailed introduction or descriptions about those different communication tools (participant 5).

**7. Exam papers**

*(Problems identified)*

*Major problem(s):*

- Organization and presentation – not well-categorised and not clearly presented (participant 1, 4, 5, 6, 8).

*(Suggestions from participants)*

- At the left side navigation bar, organize the exam papers into a main topic or a separate category such as “exam papers” rather than placing them under the “Assignments” category, and the main topic can be composed of a few sub topics e.g. “past years’ exam papers” or “previous exam papers” which would be easily accessible (participant 4, 5, 8).
- Exam papers could be included in “My Progress” (participant 6).

**8. Assignment documentation**

*(Problems identified)*

*Minor problem(s):*

- In Project 1: general introduction is too long (participant 3).

**5.2 Findings from the questionnaires**

The questionnaire survey is the final task carried out during the experiment. Each participant was given a total of six questionnaires which is corresponding to six different items (six tools or learning materials of the first level of CS1022B in the WebCT environment), and each item was rated in the view of two general perceptions: perceived usefulness and ease-of-use, and satisfaction with the particular items within the WebCT system. Please refer to the Appendix F for the students’ answers and Appendix G for the raw data. This section presents the findings of filled questionnaires from eight participants.

According to Table 1 & 2 below, we could find the overall reaction of the participants is positive. Over 30% (range from 33.33% to 56.25%) of the students feedback (Table 1) for the perceived usefulness and ease-of-use of the six items was quite likely, and five out of the six items (Table 2: Lecture slides, Course video, Self-test, Progress overview and Discussion board) have been considered as using with higher satisfaction, and at least 50% responses were for both the rank 5 and 6.

With respect to Table 1, Course video (56.25%), Discussion board (54.17%), Lecture slides (47.62%), Progress overview (35.42%), Study guide and Self-test (both 33.33%) are perceived as quite useful and easy to use, while Self-test (45.83%), Progress overview (37.5%), Lecture slides (30.95%), Study guide (27.08%), and Course video (18.75%) also show the perceived ease-of-use is slightly likely. Although there are some perceptions responding to Extremely Likely – Study guide (22.92%) and Discussion board (18.75%), other perceptions also spread around among the rank of Quite unlikely, Slightly unlikely and Neither with different percentages, thus it could indicate that a certain number of usability problems existed in the design of CS1022B module in the WebCT environment.

As for Table 2, it shows the higher user satisfaction (rank 6) of using Course video (62.5%) Progress overview (50%) and Self-test (25%), and also shows the relatively higher satisfaction (rank 5) of using Lecture slides (57.14%), Self-test (43.75%), Progress overview (37.5%), Discussion board (31.25%), and Study guide (25%). Similar to Table 1, a certain proportion of the participants felt the strong satisfaction when using some of the items, e.g. Discussion board (rank 7: 18.75%), however the neutral or negative responses from the rest of the participants also suggest they were not very satisfied with these six tools or learning materials or those functions are not very pleasant to use in some aspects, e.g. Study guide (rank 4: 31.25%, rank 3: 12.5%). It could be concluded that improvement and enhancement need to be made to the design of CS1022B in WebCT environment.

**Table 1: Perceived usefulness and ease-of-use of the six items**

No.		Extremely unlikely	Quite unlikely	Slightly unlikely	Neither	Slightly likely	Quite likely	Extremely likely
1	Study guide	0%	4.17%	6.25%	6.25%	<b>27.08%</b>	<b>33.33%</b>	<b>22.92%</b>
2	Lecture slides	0%	0%	0%	9.52%	<b>30.95%</b>	<b>47.62%</b>	11.9%
3	Course video	0%	0%	0%	10.42%	<b>18.75%</b>	<b>56.25%</b>	14.58%
4	Self-test	0%	0%	2.08%	6.25%	<b>45.83%</b>	<b>33.33%</b>	12.5%
5	Progress overview	0%	2.08%	2.08%	10.42%	<b>37.5%</b>	<b>35.42%</b>	12.5%
6	Discussion board	0%	0%	4.17%	10.42%	12.5%	<b>54.17%</b>	<b>18.75%</b>

**Table 2: Satisfaction with the six particular items**

No.		Ranging from strongly disagree to strongly agree						
		Rank 1	Rank 2	Rank 3	Rank 4	Rank 5	Rank 6	Rank 7
1	Study guide	0%	6.25%	12.5%	<b>31.25%</b>	<b>25%</b>	12.5%	12.5%
2	Lecture slides	0%	0%	0%	7.14%	<b>57.14%</b>	<b>21.43%</b>	14.29%
3	Course video	0%	6.25%	6.25%	12.5%	6.25%	<b>62.5%</b>	6.25%
4	Self-test	0%	0%	6.25%	12.5%	<b>43.75%</b>	<b>25%</b>	12.5%
5	Progress overview	0%	0%	0%	12.5%	<b>37.5%</b>	<b>50%</b>	0%
6	Discussion board	0%	6.25%	6.25%	<b>18.75%</b>	<b>31.25%</b>	<b>18.75%</b>	<b>18.75%</b>



## **6. Limitations of this study**

Several limitations existed in the current testing which could be enhanced in the future study. Mainly, they are the scope of the study and the duration of experiment session. The current testing has observed the features and functions for the first level of CS1022B, it only covered a certain part of the system, this suggests that further work could make investigations on other aspects of the system such as other submodules or units. On the other hand, the longer experiments (around 2 hours) of current study could increase the users' workload and their mental fatigue, it would be more effective and efficient if the longer sessions could be kept within a reasonable limit e.g. one hour or one hour and half or it could be split into two subsessions.

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