

Chapter 1

THE VALIDATION AND APPLICATION OF A NEW LEARNING ENVIRONMENT INSTRUMENT FOR ONLINE LEARNING IN HIGHER EDUCATION

Vanessa Chang and Darrell Fisher
Curtin University of Technology
Australia

More and more academics are accepting the challenge of using web-based or online learning in higher education to deliver coursework. Many web-sites indicate that opportunities for students to receive coursework via the Web is routine at most universities. The Internet/Web has become an important change agent in higher education and universities are reviewing their strategic plans to incorporate online learning. As a result of the increase in online courses, it is timely for learning environment research to focus on the Web. However, to date, no comprehensive instruments have been developed to assess online learning environments for higher education. A new web-based learning environment instrument is described in this chapter. The Web-based Learning Environment Instrument (WEBLEI) contains four main scales. Three scales (Access, Interaction, and Response) are built upon the work of Tobin (1998). The other scale (Results) focuses on information structure and the design of online material. The rationale behind, and development of, the WEBLEI are described in the paper. Statistical analyses, Cronbach alpha reliability coefficient, factor analysis, and discriminant validity, indicated that the WEBLEI is a reliable and valid instrument. The chapter also reports on findings involving the perceptions of undergraduate and graduate students utilising this new instrument.

1. Introduction

The rise in computer literacy of users and the trend of Internet access have presented enormous challenges for universities world wide to improve outcomes and extend access to a broad range of students. Higher education now draws students from all backgrounds from all over the world and all age groups. The Web represents a paradigm shift in

education and it signifies an evolving change in learning style where information is shared with a wider community (Brodsky, 1998). Many universities now are exploring technologies that may facilitate change in education and confront challenges that we will face as we move towards a new paradigm of continuous education in an online learning environment (Hicks, Reid, & George, 1999; Wilson, 1997).

Given the fact that the Web is being used in an increasing number of courses and in most universities, it is desirable to conduct research into the social and psychological aspects of online learning environment and to draw from it the students' perception of online learning environment. The study described here concentrates on online learning in higher education and its effectiveness as a learning environment. This is achieved by investigating students' perceptions of this learning environment.

2. Learning Environments

The concept of learning environment has existed since the 1930s (Fraser, 1994, 1998; Goh & Fraser, 1998). During the last 25 years, learning environment research has been firmly established in the traditional classroom environment particularly in the field of science education (McRobbie, Fisher, & Wong, 1998; Tobin & Fraser, 1998) and this research has recognised that students' perceptions are important social and psychological factors in classrooms (Fraser, 1994; Fraser, 1998). Very often these perceptions are assessed using questionnaires. Fraser (1998) has collated and explained a number of these learning environment questionnaires developed over the last three decades. These instruments have mainly been used in the assessment and investigation of classroom environments in primary and secondary schools (Fraser, 1998).

In recent times, there have been research studies into distance education environments for higher education levels. For example, Jegede, Fraser, and Fisher (1998) developed the *Distance and Open Learning Environment Scale* (DOLES) for university students studying in distance education. Lately, some research on learning environments has focused on the Web (Tobin, 1998). In particular, Tobin described a framework which can be used for the evaluation of learning environments in interactive environments. However, no comprehensive instruments have been developed to assess online learning environments

for higher education. Thus, it was decided to develop a new web-based learning environment instrument building on the work of Tobin (1998). Furthermore, although interest in this environment has increased in recent time (Laurillard, 1993; Khan, 1997; Palloff & Pratt, 1998; Reeves & Reeves, 1997; Tobin, 1998), there is little research and almost none at the tertiary level in the psychosocial aspects of online learning environments.

3. Paradigm Shift in Learning Environment

Many students see web-based learning as an opportunity for them to gain higher education without having to physically attend classes and academics worldwide have realised the attraction and extent of this new learning mode. The change in the teaching and learning mode from the traditional environment to online environment presents a new way of teaching and learning for both teachers and students. The view of the online learning approach, which is discussed next, is one that carries all of the teaching and learning notions of a traditional environment with emphases on constructivist and cognitive perspectives.

The styles of teaching and learning in an online environment can be characterised in a quite different manner to the traditional teaching and learning environment. Online learning is defined as a system and process that connects learners with distributed and online learning materials. The learning in this environment is characterised by separation of place and time between the teacher and learner, between learners, and between learners and learning resources. In order for this online environment to be utilised effectively, the teaching and learning activities in this environment can be characterised as having a three way interaction: one-to-one; one-to-many; and many to many (McDonald & Postle, 1999).

A one-to-one communication can be characterised as activities that were carried out by answering students' queries via electronic mail. Also included in this would be students seeking advice regarding their course or other matters from their teacher. A one-to-many communication can be described as activities carried out when the facilitator is guiding and facilitating students' progress through study materials, readings, and other postings. The final interaction type of many-to-many can be deemed as activities where on-going discussions are established amongst learners and the facilitator. This is demonstrated where discussion of a

particular topic takes place with the group sharing, collaborating, and cooperating with one another. This discussion is seen as promoting an effective and a rich learning environment.

Many authors such as Bannan and Milheim (1997), Dowling (1997), Jonassen (1994) and Laurillard (1993) have indicated that the online learning environment utilises the model of an integrated behaviourist or objectivist and constructivist model. It is claimed that this model offers a structured approach for basic skills or the content of the lesson (behaviourist or objectivist approach) whilst the constructivist design of the course includes motivating and empowering the learners in their course of study. In order to benefit from this online learning environment, learners must collaborate and interact with other students and at the same time, be able to analyse, reflect, synthesise, organise, and restructure information as well as create and contribute their own ideas (Bannan & Milheim, 1997). In contrast to the behaviourist and objectivist views of traditional learning environment, the constructivist believes that the student ought to build an internal and personal interpretation and be able to construct new knowledge based on their prior knowledge and understanding of present knowledge (Bannan & Milheim, 1997).

Another consideration of this constructivist environment involves the control of learning activities. According to Hooper and Hannafin (1991), this control of learning activities is demonstrated by students selecting and sequencing their learning activities as well as creating their own learning opportunities and satisfying their own learning needs. This approach is view as students taking control of their own learning, students being more responsible for their own learning, and thus, creating a student-centred learning environment.

As online learning becomes more collaborative and interactive, it is important to consider the changing roles of the teacher. A study conducted by Hiltz (1994) confirmed that teachers should consider their new role in an online teaching environment and ought to foster a sense of community among learners. This may mean that teachers need to pursue the role of a facilitator or a guide, rather than being an instructor where stringent instructions were usually given to students in a face-to-face setting. Hiltz (1994) found that there are three basic principles that a teacher must consider in order to establish and maintain a learning community, the principles are to: be responsive; be competent; and be organised in their facilitation of student interaction. In addition, teachers

were exhorted to provide frequent feedback, to encourage students to contribute, to acknowledge comments, and to periodically update and summarise reviews of discussion.

4. Roles of the Online Teacher and Learner

Clearly, the role of the teacher either in a classroom using face-to-face teaching or in an online setting is to ensure that some type of educational process occurs amongst the learners involved. In the traditional classroom setting, the teacher's role generally is to impart knowledge to learners (Relan & Gillani, 1997). Students in a face-to-face classroom setting see and work with one another and get to know each other well in the learning process. In the Web environment, the role of the teacher becomes that of an educational facilitator (Sherry & Wilson, 1997). As a facilitator, the teacher provides guidance and allows students to explore the course material as well as related materials without restriction.

Collins and Berge (1996) categorised the tasks and roles of the online teacher into four areas: pedagogical, social, managerial, and technical. They described pedagogical area as the functions and tasks that revolve around educational facilitation. Social function is described as the promotion of a friendly social environment which is needed in the process of online learning. The managerial aspect of online learning involves all organisational and administrative aspects of putting the learning materials online such as setting objectives, rules, and decision making norms. The technical aspect focuses on the teacher's proficiency with the use of the technology.

A successful learner should be active in the online learning environment. The roles of the online learners include knowledge generation, collaboration, and process management (Palloff & Pratt, 1998). In online learning environments, with guidance from the teacher, the learner is responsible for actively seeking solutions to problems confined within the knowledge area being studied. Students are expected to view problems and questions presented by the teacher and those of other students. Students are expected to participate actively, to learn collaboratively and cooperatively (Khan, 1997), and are expected to work together in order to generate deeper levels of understanding of the course material. Students are also expected to share the resources, and other materials that they find, with other learners. In the role of process management, students are expected to participate with minimal

guidelines, interact with one another and be involved in the discussion. Furthermore, students must be willing to speak out when they have an opinion on something or when the discussion is moving into an uncomfortable zone or when they are offended (Palloff & Pratt, 1998).

5. Web-based Learning Application

The extent to which web-based learning is applied in a course is a decision that the individual instructor must make. The instructor is the person who knows the structure of his/her course, who is responsible for the instructional pedagogy that is involved in his/her course, who determines the assessments required, and who is familiar with the level of interactivity amongst students in the course. Having evaluated the nature of the course, the instructor may then apply any one or all of the web-based learning applications according to Finder and Raleigh's (1998) informational, supplemental, dependent, and fully developed use of the Web. These four web-based applications are described in the following sections.

5.1 Informational Use

The first Web-based learning application of informational use is described as presenting factual or static information. This informational use is also known as presenting declarative knowledge. According to Finder and Raleigh (1998), information about the course, assignment descriptions, the instructor, or the entire course plan for the duration of the semester are made available on the Web. Another example of this type of informational use is the posting of the course syllabus. This information is valuable to students who want to find out more about the course before enrolling in it. Normally, this form of web-based application of informational use is used in conjunction with traditional classroom teaching.

Instructors are able to update their web-site on a regular basis and are also able to post important information pertaining to their course, for example, notifying students of changes of assignments, class times, scheduled events and so on. In fact, students should be able to receive all notices about their course on this "informational" web-site.

The informational form of web-based application does not normally include key concepts of web-based learning such as interactivity, social,

and collaborative learning. Another type of web application is that of supplemental use.

5.2 Supplemental Use

Supplemental use of the web is used in conjunction with informational use. According to Finder and Raleigh (1998), in supplemental use, students use the Web to complete part of the course. Students may also complete an assignment, or part of an assignment, using this form of web-based application. Instructors can give direction to students who are looking to further their understanding about certain lecture materials by incorporating links to related sources. By providing some guidance, students are able to explore and research similar web-sites that can explain a specific topic in greater detail (Pan, 1998).

5.3 Dependent Use

A third approach of the web-based application is dependent use, where students are encouraged to be active and collaborative learners. According to Finder and Raleigh (1998), most course materials exist on the Web as well as links to related sources, and students use the Web as a major course component when completing assignments. The mode of teaching used with this form of web-based application is normally mixed. Dependent use of the Web suggests that the material provided online includes some classroom teaching but the online component plays an integral part in the course and the access to the materials is normally planned for students to use in their course.

Instructors using the Web for dependent use must also take on a commitment in relation to the make up of the student's experience of the course. This involves the inclusion of a range of components such as course information, course content and materials, and additional learning resources in the overall online course material. Instructors must be able to provide guidance to students, especially when students use the Web to complete their assignments either individually or in a group. In order for this dependent use to be effective, instructors must be able to perform some of the roles of the online teacher.

5.4 Fully-Developed Use

The fourth approach of web-based application, namely, fully-developed use, covers all the earlier applications of informational, supplemental, and dependent uses of the Web. According to Finder and Raleigh (1998), in fully-developed use, the entire course is delivered via the Web, and students and teacher may never meet face to face. It is made clear that the primary source of learning is online. King (1993) describes the fully-developed use of the Web as the comprehensive replacement of earlier forms of delivery (i.e., traditional teaching) and the function of comprehensive replacement is to provide an extensive course in an electronic or online learning environment.

Instructors using the Web in fully-developed use must incorporate student-centred learning and a range of flexible teaching and learning strategies. The online course materials used in this approach must be comprehensively developed. Apart from including all components such as course information, course content and materials, which have already been described in the earlier approaches, administrative aspects such as maintenance of course assessment, and the entire management of the course must also be incorporated in this type of application.

Both instructors and students play an important role in this fully-developed use. As the course material is used totally online, where minimal or no face-to-face contact is present, instructors and students must adjust to the new way of teaching and learning.

Courses that are developed online and are within the approaches of dependent and fully developed use of the Web, are classified as courses conducted in an online learning environment. The rationale for this is that instructors must develop the online course materials focused on a student-centred approach and that they must use a range of online teaching and learning strategies to set up their learning tasks. Also, instructors and students must understand their online roles before they can contribute and participate successfully in an online environment.

6. Development of the Web-Based Learning Environment Instrument (WEBLEI)

As online learning is becoming more and more popular, it was decided to develop a learning environment questionnaire for use in university settings. This new instrument was named the *Web-Based Learning*

Environment Instrument (WEBLEI). This instrument was designed with four scales to capture students' perceptions of web-based learning environments. The first three scales of emancipatory activities, co-participatory activities, and qualia are adapted from Tobin's (1998) work on *Connecting Communities Learning* (CCL) and the final scale focuses on information structure and the design aspect of the web-based material. Each of these aspects is explained in the following sections.

6.1 WEBLEI Scale I: Emancipatory Activities

Tobin (1998) listed three main categories of convenience, efficiency and autonomy for emancipatory activities.

- Convenience is achieved when students can access the learning activities at convenient times.
- Efficiency is described as not having to attend on campus classes and therefore allowed for efficient use of time.
- Autonomy is described as allowing students to decide when and how to access the curriculum. (Tobin, 1998, p. 151)

6.2 WEBLEI Scale II: Co-Participatory Activities

According to Tobin (1998), "co-participation implies the presence of a shared language which can be accessed by all participants to engage the activities of the community, with a goal of facilitating learning." Included under the co-participatory activities are six categories of flexibility, reflection, quality, interaction, feedback and collaboration.

- Flexibility is described as allowing students to meet their goals.
- Reflection is noted as asynchronous interactions which encouraged reflective interactions.
- Quality is linked to the learning reflected in the level of activity undertaken by the students.
- Interaction is described as enabling students to interact with each other asynchronously.
- Feedback is described as the availability of feedback from students and the teacher.
- Collaboration enabled students to collaborate in a variety of activities. (Tobin, 1998 p. 152)

The focus of this aspect is on the learning activities in which the students participate. This includes structuring of activities in which students use their existing knowledge to apply to the present subject and build new understandings from the present subject. This co-participatory aspect is aligned with Laurillard's (1993) analysis of how learners 'come to know' through (1) active learning, (2) feedback, and (3) reflection.

6.3 WEBLEI Scale III: Qualia

Tobin (1998, p. 155) explained qualia as describing knowledge which is considered "as embodied in neural networks theory Churchlands (1989, 1996) which conceptualises knowing in terms of electronic loadings on a matrix of neurons that tightly couples qualia and cognitive ways of knowing."

Tobin (1998) described six categories of qualia. They are enjoyment, confidence, accomplishments, success, frustration and tedium.

- Enjoyment is associated with academic success and mastery of technology.
- Confidence is associated with successful learning and support for learning.
- Accomplishments are described as allowing student to display their course accomplishments regularly and publicly.
- Success has two dimensions - use of technology and conceptual aspects of the program.
- Frustration is associated with the use of technology and the conceptual aspects of the program.
- Tedium is associated with posting and responding to reviews on a regular basis. Tobin (1998, p. 155)

6.4 WEBLEI Scale IV: Information Structure and Design Activities

Information structure and design deals with how the web based learning materials are structured and organised, and whether the materials presented follow accepted instructional design standards, such as stating its purpose, describing its scope, incorporating interactivity, and providing a variety of formats to meet different learning styles. Included

in this section are relevance and scope of content, validity of content, accuracy and balance of content, navigation, and aesthetic and affective aspects.

6.4 Rationale for WEBLEI

The rationale for selecting these four scales, together with their relationship with Tobin's work on *Connecting Communities Learning*, is represented in Figure 1.1. In order to study online, it is necessary to have accessed (Scale I) to some web-based learning material or a virtual subject. This scale, named Access, is necessary to ascertain the convenience of accessing the learning activities, the efficiency in terms of accessing the learning materials at a location suitable to the student and the autonomy of accessing the learning materials at a time convenient to the student.

Once access to the learning materials is established, it is vital that students interact with one another to achieve the learning outcomes set out in the learning materials. Scale II (Interaction), assesses the extent to which the students participate actively, and work in a collaborative and cooperative manner with other students in order to achieve the learning outcomes.

Once students have access (Scale I) to the learning materials and that they are actively participating (Scale II) in the learning activities, students should be able to indicate how they feel (Scale III: Response) in using this type of learning environment. Students are able to respond by indicating their perception of this learning environment and whether they have accomplished any learning objectives through this learning environment.

Having gone through all the learning activities, from access (Scale I) to interaction (Scale II) to response (Scale III), students should be able to determine what they have gained (Scale IV: Results) from learning in this environment. Therefore, the WEBLEI is composed of items arranged in four scales and is presented in Table 1.1. The instrument uses a 5-point Likert scale response options of Almost Never, Seldom, Sometimes, Often, and Almost Always.

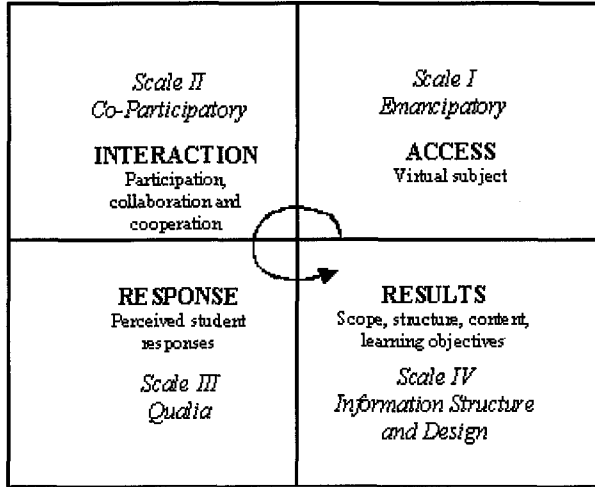


Figure 1.1. WEBLEI scales

Table 1.1. WEBLEI Scales and Items

Scale I: Access

1. I can access the learning activities at times convenient to me.
 2. The online material is available at locations suitable for me.
 3. I can use time saved in travelling and on campus class attendance for study and other commitments.
 4. I am allowed to work at my own pace to achieve learning objectives.
 5. I decide how much I want to learn in a given period.
 6. I decide when I want to learn.
 7. The flexibility allows me to meet my learning goals.
 8. The flexibility allows me to explore my own areas of interest.
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Scale II: Interaction

1. I communicate with other students in this subject electronically (email, bulletin boards, chat line).
 2. In this learning environment, I have to be self-disciplined in order to learn.
 3. I have the autonomy to ask my tutor what I do not understand.
 4. I have the autonomy to ask other students what I do not understand.
 5. Other students respond promptly to my queries.
 6. I regularly participate in self-evaluations.
 7. I regularly participate in peer-evaluations.
 8. I was supported by positive attitude from my peers.
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Table 1.1. Continued

Scale III: Response
1. This mode of learning enables me to interact with other students and the tutor asynchronously.
2. I felt a sense of satisfaction and achievement about this learning environment.
3. I enjoy learning in this environment.
4. I could learn more in this environment.
5. It is easy to organise a group for a project.
6. It is easy to work collaboratively with other students involved in a group project.
7. The web-based learning environment held my interest throughout my course of study.
8. I felt a sense of boredom towards the end of my course of study.

Scale IV: Results
1. The scope or learning objectives are clearly stated in each lesson.
2. The organisation of each lesson is easy to follow.
3. The structure keeps me focused on what is to be learned.
4. Expectations of assignments are clearly stated in my unit.
5. Activities are planned carefully.
6. The subject content is appropriate for delivery on the Web.
7. The presentation of the subject content is clear.
8. The quiz in the web-based materials enhances my learning process.

7 Reliability and Validity of the WEBLEI

7.1 Factor Analysis

The WEBLEI was administered to two groups of Electronic Commerce students from Curtin Business School at Curtin University, Perth, Western Australia.

A total of 344 responses were received. A factor analysis was conducted to examine the internal structure of the instrument. A principal factor analysis was carried out to extract four factors and this was followed by a varimax rotation. The results of the factor analysis confirmed that there were indeed four scales in the WEBLEI. Table 1.2 shows the items for each of the four factors.

Table 1.2. The WEBLEI Items on Four Factors

Item	Access	Interaction	Response	Results
1	0.428			
2	0.421			
3	0.505			
4	0.465			
5	0.607			
6	0.556			
7	0.609			
8	0.626			
9			0.435	
10		0.459		
11		0.348		
12		0.393		
13		0.601		
14		0.568		
15		0.648		
16		0.609		
17			0.677	
18			0.705	
19			0.595	
20		0.449		
21			0.502	
22			0.514	
23			0.439	
24			0.336	
25				0.642
26				0.637
27				0.668
28				0.631
29				0.662
30				0.582
31				0.678
32				0.394
% of Variance	25.2	5.3	4.9	4.1
Eigenvalue	11.9	2.5	2.3	1.9

Factor loading < 0.30 not included

7.2 Reliability and Discriminant Validity of the WEBLEI

Table 1.3 provides some information about the internal consistency, using Cronbach alpha reliability coefficient, and the discriminant validity, using the mean correlation of a scale with the other scales as a convenient index, of the WEBLEI. The Cronbach alpha reliability coefficients presented in the table show that the figures ranged from 0.68

to 0.87. According to Nunnally (1967), a reliability coefficient of 0.60 or greater is acceptable. Therefore, the figures indicate that they are satisfactory in terms of their internal consistency. The discriminant validity shows that the mean correlations ranged from 0.37 to 0.49 indicating that the scales of the WEBLEI measure distinct although somewhat overlapping aspects of the online learning environment.

Table 1.3. Cronbach Alpha Reliability and Discriminant Validity (Validation Statistics) and Descriptive Statistics of the WEBLEI Questionnaire

Aspects	Items	Valid Cases	Validation Statistics		Descriptive Statistics	
			Alpha Reliability	Discriminant Validity	Mean	sd
Scale I: Access	8	310	0.79	0.49	3.96	0.53
Scale II: Interaction	8	318	0.68	0.37	3.55	0.51
Scale III: Response	8	318	0.69	0.49	3.37	0.53
Scale IV: Results	8	312	0.87	0.49	3.72	0.57

8. An Application using the WEBLEI

8.1 Means and Standard Deviations

The mean scores (as shown in Table 1.3) of 3.96, 3.55, 3.37, and 3.72 for these four scales respectively, indicate that on average students gave a response of “Sometimes” to “Often” on the items in these scales. These are a relatively high means (3.65) for the scales.

The mean score of Scale 1 of Access of 3.96 shows that students generally agree that they can access the online learning materials in their learning environment in a convenient and efficient way. As such this learning environment apparently provides them the autonomy of when and how they intend to access the learning materials.

The mean score of Scale II of Interaction of 3.55, which ranges from “Sometimes” to “Often”, indicates that the students believed they were able to participate and interact regularly with oine another and their lecturer enhancing their chance of being successful and effective learners in this environment.

Scale III of Response has a mean score of 3.37 and indicates that students feel a sense of achievement and satisfaction once they have completed the online learning unit. The course developer must also incorporate different learning activities in order to maintain students’

interest in the course of study and to ensure that students do not feel bored towards the end of the course.

The last scale, Scale IV of Results has a mean score of 3.72 indicates that students agree that the learning objectives and organisation of the online materials were important in guiding them in their studies. It is imperative for course developers to know that having the unit activities planned carefully for students will assist the students in their course of study.

7.2.1 Demographic Profile

Demographic information also was gathered about the students who responded to the WEBLEI. These data helped explain the results obtained with the WEBLEI. Table 1.4 shows the number of students who were enrolled in an online unit for the first time. Interestingly the figures in Table 1.4 show that majority of students (95.3%) are new to the concept of studying a unit in an online mode.

Table 1.4. Number of Students Studying Online for the First Time

First Online Unit	Female	Male	Total
Yes	105	150	155
No	30	41	71
Did not indicate	4	3	7

Table 1.5 shows the use of different access methods in studying the unit. It is obvious that the use of electronic mail (mean score of 4.14, towards *Always*) was a popular method of interacting with other students and tutors.

Table 1.5. Mean and Standard Deviation of Student Access

	Cases		E-mail	Phone	Bulletin Board	Chat Line	Online Study Materials	Remote Library
Male	193	Mean	4.10	2.85	3.21	2.73	3.75	2.82
		SD	0.84	1.16	0.99	1.16	1.08	1.09
Female	139	Mean	4.19	2.75	3.18	2.62	3.60	2.90
		SD	0.86	1.20	1.00	1.21	1.10	1.27
Total	332	Mean	4.14	2.81	3.20	2.68	3.69	2.85
		SD	0.85	1.17	0.99	1.18	1.09	1.17

The use of the online study materials with a mean of 3.69 shows that the unit materials were accessed and used by most students. The use of bulletin board and remote library access was also an indication that assistance was sought online. Table 1.5 also shows that male and female students were similar in their patterns of access.

Table 1.6 shows that students spent most of their time studying at home (towards Often). This is consistent with the concept of online learning where students are encouraged to telecommute or to study in a virtual environment. Again male and female students were similar in their selections of a place for studying.

Table 1.6. Mean and Standard Deviation of Time Spent in Online Unit

Cases			Home	Campus	Work	Library	Other
Male	193	Mean	4.07	3.09	1.53	2.88	2.17
		SD	0.86	0.93	0.92	0.88	0.992
Female	138	Mean	4.16	3.15	1.247	2.70	1.97
		SD	0.85	1.10	0.54	0.99	1.01
Total	331	Mean	4.11	3.11	1.41	2.80	2.09
		SD	0.86	1.00	0.79	0.93	1.00

9. Conclusion

This paper has described a new instrument, which assesses student perceptions of four core aspects of the Web-based learning environment, namely, Access, Interaction, Response, and Results. The development and validation of the WEBLEI is a significant outcome of this study. This instrument has been shown to have factorial validity and the WEBLEI scales of Access, Interaction, Response, and Results have acceptable reliability and discriminant validity from a statistical perspective. This instrument has been designed to be used by tertiary teachers who have their courses delivered as dependent and/or fully-developed Web-based learning applications. This instrument has also been carefully developed to incorporate the four scales of accessing the online materials (Scale I: Access), the interaction and participation of all parties involved in the online learning (Scale II: Interaction), the responses and perceptions of students learning in this environment (Scale III: Response), and finally, the students' learning outcome and

achievement in this learning environment (Scale IV: Results). The survey of 334 students indicate that the concept of online learning is well received by these students. The availability of this instrument will allow researchers and developers to evaluate their own Web-based learning environments in accordance with the suggested scales.

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