Delivering health education via the World Wide Web: an investigation of knowledge construction, attitude and behaviour change within collaborative learning environments

Lori Ann Lockyer

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DELIVERING HEALTH EDUCATION VIA THE WORLD WIDE WEB: AN INVESTIGATION OF KNOWLEDGE CONSTRUCTION, ATTITUDE AND BEHAVIOUR CHANGE WITHIN COLLABORATIVE LEARNING ENVIRONMENTS

A thesis submitted in fulfilment of the requirements for the award of the degree

DOCTOR OF PHILOSOPHY

from

THE UNIVERSITY OF WOLLONGONG

by

LORI ANN LOCKYER
BA (Hons), MLIS

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To, my supervisor, Professor Barry Harper, for his exceptional guidance.

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ABSTRACT

This study sought to investigate the efficacy of using Web-based learning environments in the delivery of health education at the undergraduate level.

This study was conducted in two phases. Phase 1 involved the reconceptualisation and development and formative evaluation of face-to-face and Web-based tutorial learning activities associated with an undergraduate health education subject. This phase of the study included a review of the theoretical and applied literature and practice related to the design of effective health education learning strategies in the undergraduate sphere. This review brought about the focus on a student-centred, collaborative strategy that could be conducted within both face-to-face and Web-based learning environments. This phase also involved the design and development of a prototype Web-based learning environment to support the learning activities for the subject. While face-to-face tutorials have been the traditional delivery format in the university setting, reflection on the procedures required to implement such collaborative learning activities within a face-to-face delivery mode was also included in this phase of the investigation. Phase 1 also included a multi-faceted formative evaluation of the learning activities and of the prototype Web-based learning environment to facilitate those activities. The results of the formative evaluation were utilised to revise the learning activities and learning environments.

Phase 2 of this investigation involved the design and implementation of two experiments that explored the strengths and weaknesses of each of the face-to-face and Web-based learning environments in facilitating collaborative health education learning activities within the health education subject.

Experiment 1 coincided with the first half of the academic session. Students enrolled in the subject were randomly assigned into two tutorial classes and further randomised into learning groups of four or five participants. Each tutorial class was randomly assigned to one of two learning environments (face-to-face or Web) for the first experiment. In the second experiment (i.e., the second half of the academic session), groups crossed over to engage in their tutorials within the alternate learning environment.
Both quantitative and qualitative data were collected during these experiments to respond to the research questions. Pre-tests and post-tests for knowledge, attitude and behaviour related to the health topics covered by the learning activities were administered to all students. To investigate the nature of the learning group interactions, the collaborative learning activities were recorded (via audio-tape and electronic Web logs). Additionally, the group output of each collaborative activity was collected to explore the quality of response from each learning group. Once participants had engaged in the learning activities, a representative of each learning group was chosen, at random, and asked to engage in an in-depth interview regarding their experience and perceptions of the face-to-face and Web learning environments. At the conclusion of both experiments, all participants were asked to complete a survey that included items related to their experience engaging in the face-to-face and Web-based learning activities and their perception of the effectiveness of the learning environments. Pre-test and post-test surveys which measured attitude toward using computers was also administered to all participants. These data were analysed and considered in light of the research questions and the literature.

The findings of the study suggest Web-based learning environments with embedded collaborative activities effectively foster health-related knowledge construction and attitude and behaviour change. Furthermore, variations in the nature of interaction among learning groups exists in different learning environments suggesting that Web-based learning environments might best facilitate health education learning activities that explore controversial or confronting issues. Learners perceive great value in aspects of face-to-face tutorials that are not easily transferred to the Web-based situation — particularly immediate interaction with the lecturer. Nevertheless, students perceive Web-based learning environments to be effective in facilitating their understanding of health education issues as much as or more than face-to-face situations.
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Background to the Study

The Internet, specifically the application of the World Wide Web (referred to as WWW or the Web) has been acclaimed as a technology that will revolutionise education. Both popular and academic literature have suggested that the Web provides for a number of learning experiences that enhance what was possible in the traditional learning environment. Khan (1997) states that the Web is "one of the most important economic and democratic mediums of learning and teaching at a distance" (p. 5). Technologies that have been successful tools for teaching and learning have shared common features of a standardised format and simplicity of use (Crossman, 1997). These features are also attributed to the World Wide Web (Khan, 1997). The suggested benefits are many:

- Direct access to a variety of international resources on a broad range of topics.
- Access to a learning environment that is not limited to scheduled lecture and tutorial hours.
- Greater opportunities for facilitating a variety of instructional strategies including small group discussion and collaborative projects.
- Exposure to and a forum for expressing and sharing different ideas, beliefs and attitudes in a potentially less confronting environment.

Such benefits would provide support particularly for disciplines such as health education that consists of a dynamic knowledge base, is best facilitated by discussion-based or collaborative learning strategies, and requires the exploration of health-related attitudes and values. However, these assumptions about the potential
of the Web in facilitating learning in terms of such benefits generally remain untested. Thus, it is timely to examine this issue in real educational environments.

The World Wide Web came into being in 1990 with the development of Hyper Text Markup Language (HTML), a computer code which allowed for the transfer of graphical information across the Internet. In 1993, the first software (known as a browser) that made displaying and viewing HTML code possible was released (Mayr, 1996). The significance of the development of the World Wide Web, HTML code and Web browsers has been in the increased capability of individuals and institutions to publish and disseminate important resources in multimedia format (i.e., text, image, audio, and video) and for individuals to gain easy access to those resources.

In the traditional university experience, students and instructors accessed resources, such as printed monographs and journals, to support their learning and teaching, within the library on the university campus. With the increasing use of the Web, today the options to access academic resources are extensive:

- University libraries provide access to their catalogue, and reference librarians, via the Web.
- Electronic texts of public domain works are accessible via the Web.
- Archived and current articles published in scholarly journals from a variety of disciplines are available electronically in full-text form.
- There has been a proliferation in scholarly e-journals (refereed serials that are only available in electronic form).
Access to such resources is an especially important consideration in supporting a discipline such as health education in which the knowledge base is constantly adapting to the findings of health-related research. In a climate of declining funds in universities that has resulted in decreasing library collections, access to the latest health-related information and research is crucial for the health educator and student.

Initial implementations of the use of the Web in higher education settings involved the provision of subject materials such as subject outlines, readings, bibliographies, lecture notes and links to related Web sites (Shotsberger, 1996). Increasingly, university lecturers have taken advantage of the capabilities of the Web in providing teaching and learning experiences for students. A university education is no longer limited to students and instructors gathering in a common physical location (i.e., the university campus) to engage in scheduled lectures in lecture theatres, seminar discussions in tutorial classrooms and practical sessions in laboratories. The Web provides access to a learning environment that is not limited by time and space. The literature regarding Web-based instruction increasingly highlights descriptions of implementations of a range of teaching and learning strategies that have been utilised within a number of disciplines. The range of strategies has included video lectures, small group discussions and collaborative projects — strategies that have long been theorised to support the exploration of health education.

This capability of the Web to facilitate discussion and collaboration between students and instructors has been viewed as a "stunning indicator that technology is more compelling as a medium of community than as a tool for information" (Schrage, 1995, p.152). The Web has created opportunity for a variety of pedagogical strategies that
might be implemented within class groups or between classes and individuals around the globe. This allows students to benefit from multiple perspectives and engage in cross-cultural experiences (Khan, 1997). Because communication that is supported through computer networks can remove face-to-face biases relating to characteristics such as race, age, or gender, students are provided with a forum for expression that can be considered risk-free and self-esteem and self-confidence enhancing (Collis, 1992). Thus, Web-based learning environments can provide students with the opportunity to express and explore different beliefs and attitudes in a non-confronting situation.

When such benefits of the World Wide Web are considered, it seems that this might be a technology that will address the challenges facing the educational sphere — challenges that abound in the specific discipline of health education.

**Statement of the Problem**

While the mission or goal of institutions of higher education may be an issue for social debate, there are some aspects of the higher education experience that can be viewed as important. Higher education exposes students to the concepts and body of knowledge related to a particular discipline (or range of disciplines). In relation to professional studies, higher education introduces students to a community of practice and facilitates the development of skills such as critical thinking, quantitative reasoning, information literacy, and effective communication (Ramsden, 1992; Skiba, 1997).
Within the area of health education — particularly the academic training of health educators — there are specialised demands for higher education. Such demands include:

- adequate coverage of a broad range of health topics;
- facilitation of a variety of pedagogical strategies that include real-world application;
- opportunities for reflection in small group discussion to facilitate sharing and understanding of health attitudes and values;
- development of an appreciation for the diverse aspects of health issues as they affect different populations and cultures;
- encouragement for learners to take on other points of view in non-confronting, non-instructor-directed environments; and
- provision of exposure to alternative ways that teachers can present health education to their students that are motivating, creative and innovative.


There has been criticism that traditional university teaching was largely devoid of cognitively powerful pedagogical strategies (such as those noted above) because many effective classroom practices were difficult to integrate and implement within traditional structural frameworks of instruction (Cuban, 1993). Confounding such issues, the delivery of an effective program has become increasingly difficult in the university setting. Australian universities are experiencing similar resource pressures as their counterparts in other developed countries. Increasing student enrolments coupled with declining proportions of tenured academic staff have reinforced the
reality of didactic tutorial where the instructor spends the majority of the time lecturing to students (Ainley, Malley, & Lamb, 1997; Brown & Atkins, 1991; OECD, 1997; Webb, 1983; Welch, 1998). At the same time, the profile of university students is changing. University students, particularly in the Australian context, are likely to have lifestyles in which there are competing demands on their time (Gosper, Hesketh, Andrews, & Sabaz, 1996; McInnis, James, & McNaught, 1995; Skiba, 1997). Students are demanding flexibility in their learning experiences (Gosper et al., 1996). These phenomena have been experienced in the delivery of health education where the theoretical inclination to utilise flexible, student-centred strategies such as small group discussion and collaborative projects more often than not gives way to the reality of mass lectures and didactic tutorials.

Educational technology, specifically the World Wide Web, has the potential to address such pressures. Oliver and Omari (1999) have noted,

... in instances where universities are looking to economies of scale in the forms of delivery employed, the capacity of, and opportunities for, staff to employ such teaching and learning strategies, are becoming limited and less viable. Increasingly educators are looking to learning technologies as a possible solution to the problems associated with delivering quality programs efficiently to large numbers of students (p. 59).

Moreover, many educators and students expect that Internet/Web technology will be a component of that solution (Gosper et al., 1996). However, as Reeves and Reeves (1997) have noted, "Despite all the interest, little research evidence exists to support claims for the effectiveness of Web-based instruction (WBI)" (p. 59).

Thus, the problem is that universities are turning to the World Wide Web to alleviate these challenges without evidence to support the efficacy of the Web in delivering
education. Again, this is true in health education and, given its inherent complexities of interaction between knowledge, attitudes and behaviours, the problem is one deserving of investigation.

**Purpose of the Study**

This study sought to respond to these problems by evaluating the efficacy of using a Web-based learning environment in the delivery of a health education subject.

The study reconsidered the pedagogical strategies for a particular health education subject provided in a higher education setting that was traditionally delivered by mass lectures and didactic tutorials. This study sought to explore how collaborative learning activities, that had the potential to enhance the health education experience of students, could be conducted within a Web-base learning environment. In doing so, the study not only looked at the potential outcomes related to Web delivery, but it allowed for a comparison to face-to-face delivery by utilising the same strategies in both environments.

Finally, the study aimed to investigate the learning interactions and measure the learning outcomes (specifically knowledge construction and attitude and behaviour change) for participants who engaged in collaborative learning activities within the Web-based and traditional face-to-face learning environments.

**Significance of the Study**

The significance of this study lies in its testing of the efficacy of the use of Web-based learning environments in delivering health education.
The findings of the study provide an understanding of how knowledge construction and attitude and behaviour change have the potential to be facilitated in a Web-based learning environment. The findings of this study provide an understanding of the nature of the learning collaboration that can be experienced by students participating in a Web-based or traditional face-to-face learning environment. The findings of this study also add to the understanding of students' perceptions of their learning experience when engaged in a Web-based learning environment. In summary, these findings enrich the growing body of literature which guides instructional designers of Web-based learning environments.

**Research Questions and Hypotheses**

The research questions that guided this study were both qualitative and quantitative in nature. Hypotheses were generated for those questions that related to quantitative aspects of the investigation.

**Research Question One**

Research question one was primarily quantitative in nature. The question was:

*How effective is the use of a Web-based learning environment in delivering health education relative to that of the traditional face-to-face environment in terms of knowledge, attitude and behaviour change?*
The research hypothesis related to this question was:

There will be a difference between the effect of the Web and the face-to-face environment on knowledge, attitude and behaviour related to health education.

Thus, the null hypothesis was:

There will be no difference between the effect of the Web and the face-to-face environment on knowledge, attitude and behaviour related to health education.

**Research Question Two**

Research question two was essentially qualitative in nature. The question was

How do learners participate in and contribute to collaborative health education learning activities within Web-based and face-to-face learning environments?

**Research Question Three**

Research question three was also qualitative in nature. The question was

What are learners' perceptions of the effectiveness of Web-based learning environments for health education?
Research Question Four

Research question four was:

What impact does using a Web-based learning environment for health education have on learners' attitude toward using computers?

Assumptions

The following assumptions were made in the study:

- Collaborative learning activities contribute to improved learning outcomes in both Web-based and face-to-face environments.
- Students would participate in and complete the collaborative learning activities in their assigned learning environment.
- Students would participate in the research study and thus provide data.

Limitations

The results of this study should be viewed in light of the following limitations. Firstly, the study was limited to one subject (i.e., EDUP144: Health and Health Behaviour) within a course of study aimed at the preparation of physical and health education teachers within a higher education setting. While the specific subject within which the study was implemented covered general health issues, the underlining context of presentation was students' application of these issues in secondary schools as physical and health education teachers. This factor is a consideration in application of the findings of this study to the delivery of university subjects in health or other disciplines.
Similarly, the study was limited to students enrolled in the subject, *EDUP144: Health and Health Behaviour*, in which the investigation was implemented. Participation and satisfactory completion of this subject is a requirement for students enrolled in the Bachelor of Education - Physical and Health Education degree program at the University of Wollongong. Of the 62 students who participated in the subject (and the investigation), 57 were enrolled in this degree program. While students voluntarily participated in the study, it was reasonable to assume that the majority of the students held a certain level of interest in the topics covered in the subject and held a vested interest in successfully completing the subject. Furthermore, the number of students enrolled in the subject, *EDUP144: Health and Health Behaviour*, in the particular academic session in which the study was implemented, limited the sample size of the study.

**Overview of the Study**

This study was conducted in two phases. Phase 1 involved the reconceptualisation and development and formative evaluation of face-to-face and Web-based tutorial learning activities associated with an undergraduate health education subject entitled *EDUP144: Health and Health Behaviour* (offered by the Faculty of Education, University of Wollongong). This phase of the study included a review of the theoretical and applied literature and practice related to the design of effective health education learning strategies in the undergraduate sphere. This review brought about the focus on a student-centred, collaborative strategy that could be conducted within both face-to-face and Web-based learning environments. This phase also involved the design and development of a prototype Web-based learning environment to support the learning activities for the subject. The design was based on both a review of the
literature relating to the design and construction of educational Web sites and computer-mediated communication systems and a consideration of the characteristics of the students typically enrolled in the course in which this study was conducted. While face-to-face tutorials have been the traditional delivery format in the university setting, reflection on the procedures required to implement such collaborative learning activities within a face-to-face delivery mode was also included in this phase of the investigation. Phase 1 also included a multi-faceted formative evaluation of the learning activities and of the prototype Web-based learning environment to facilitate those activities. The results of the formative evaluation were utilised to revise the learning activities and learning environments.

Phase 2 of this investigation involved the design and implementation of two experiments that explored the strengths and weaknesses of each of the face-to-face and Web-based learning environments in facilitating collaborative health education learning activities within the Spring 1998 offering of Health and Health Behaviour.

Experiment 1 coincided with the first half of the academic session. Students enrolled in the Health and Health Behaviour subject were randomly assigned into two tutorial classes and further randomised into learning groups of four or five participants. Each tutorial class was randomly assigned to one of two learning environments (face-to-face or Web) for the first experiment. In the second experiment (i.e., the second half of the academic session), groups crossed over to engage in their tutorials within the alternate learning environment.
Both quantitative and qualitative data were collected during these experiments to respond to the research questions. Pre-tests and post-tests for knowledge, attitude and behaviour related to the health topics covered by the learning activities were administered to all students. To investigate the nature of the learning group interactions, the collaborative learning activities were recorded (via audio-tape and electronic Web logs). Additionally, the group output of each collaborative activity was collected to explore the quality of response from each learning group. Once participants had engaged in the learning activities, a representative of each learning group was chosen, at random, and asked to engage in an in-depth interview regarding their experience and perceptions of the face-to-face and Web learning environments. At the conclusion of both experiments, all participants were asked to complete a survey that included items related to their experience engaging in the face-to-face and Web-based learning activities and their perception of the effectiveness of the learning environments. Pre-test and post-test surveys which measured attitude toward using computers was also administered to all participants. These data were analysed and considered in light of the research questions and the literature.

**Structure of the Thesis**

This thesis consists of six chapters. Chapter 2 provides a synthesis of the literature reviewed to form the theoretical and practical basis for this study. Chapter 3 details the first phase of this investigation, specifically the design, formative evaluation methodology, findings and subsequent revision of learning activities and learning environments. Chapter 4 describes the methodology used to conduct the experiments in phase 2 of the investigation. Chapter 5 details the findings of the phase 2 experiments. Chapter 6 discusses the results of the phase 2 experiments (i.e., the
findings presented in Chapter 5) in relation to the research questions. Theoretical and methodological issues are raised within the discussion of each research question. Chapter 6 also concludes the thesis and presents issues that might be elaborated on through further investigation.
Chapter 2: Review of the Literature

This chapter provides a synthesis of the literature that was reviewed to form the theoretical and practical foundation for this study. There were three main objectives in the review of literature exploring the nature of health education pedagogical strategies that effectively facilitated learning in both face-to-face and Web-based environments. Firstly, it was necessary to review literature pertaining to the nature of health education, the theoretical basis (educational and behavioural) of health education, and potential teaching and learning strategies that could be utilised for health education. Secondly, the features of the World Wide Web and their potential educational benefits were explored. Finally, literature that reported experiences and outcomes of studies similar to this investigation was reviewed.

Nature of Health Education and Theoretical Frameworks

This study focused on health education within the higher education setting. Knowledge, attitudes and, ultimately, the concept of health behaviour were central themes in the literature that defined health education. As Glanz, Marcus Lewis and Rimer (1990) explained:

The central concern of health education is health behaviour. It is included in every definition of health education and is the crucial dependent variable in research on the impact of health education intervention strategies. Positive changes in health behaviour are the ultimate aims of health education programs... (p. 9).

The concept that health education was derived from an eclectic scientific base supported the need to consider a variety of theoretical frameworks as a foundation for investigating effective pedagogical strategies and learning environments.
The literature provided a number of definitions of health education in both broad and narrow terms (Bedworth & Bedworth, 1978; Fodor & Dalis, 1989; Glanz et al., 1990; Greene & Simons-Morton, 1984; Read & Greene, 1980; Shirreffs, 1984). The following list encompassed the spectrum of definitions and explanations of the nature of health education:

- Health education is a professional field and an academic discipline, and eclectic in nature for its scientific base.
- Health education strategies provide needed approaches to bridging the gap between scientific discovery and its application for everyday healthful purposes.
- Health education is an integral part of the school curriculum at all levels and an integral component of community-based health programs.
- Health education contributes to the total education of the individual by providing meaningful experiences that can positively influence health behaviour.
- Health education principles and strategies are based on and improved through basic and applied research.
- Health education facilitates the primary prevention of health problems.
- Health education is most appropriately engaged in by the professionally prepared health educator. (Shirreffs, 1984, p. 41).

The notion of health education as a profession was an important consideration in this investigation. Firstly, exploration of the goals of the health educator involved the exploration of concepts of effective teaching and learning with the field. Secondly, the educational objectives specific to the particular subject (i.e., Health and Health Behaviour) that provided the context for the investigation involved exploration of the discipline-based aspects of health education such as theory and application in terms of physical, emotional, and social factors related to specific diseases and nutrition. However, the subject was placed within a course of study aimed at the training of
health educators. Thus, where possible, it was necessary to explore the application of the discipline-based concepts to the authentic environment of a health educator.

It was noted that health and health education drew on a number of behavioural theories and models such as the health belief model, the theory of reasoned action, social cognitive theory, theory of planned behaviour, and the transtheoretical (or stages of change) model. Behavioural theories and models have been utilised within health education in an "attempt to identify the factors underlying the decision to engage (or not to engage) in given behaviours..." (Rhodes, Fishbein, & Reis, 1997, p. 21). Review of health-related literature related to behaviour theory and models demonstrated the complexity of this field. It was evident that these theories and models shared mutual concepts in terms of the factors that contribute to decision-making related to health behaviours. These commonalities included cognitive, affective and social components such as: cognitive processes; existing attitudes, beliefs and values; social interactions; perceptions of social norms; perceptions of personal risk; intentions to engage in specific behaviours; and self-efficacy regarding behavioural performance.

These shared elements of health-related behaviour theories and models relate directly to constructivist approaches to learning which are directly linked to the literature pertaining to educational technology. Shirreffs (1984) noted that "contemporary views of health define it as a process instead of a condition and as a concept with physical, social, emotional and spiritual dimensions" (p. 39). Similarly, the general view of constructivism is that learning is an active process of constructing knowledge.
and involves cognitive, affective and social elements. Jonassen (1994) defined the theoretical framework in this way:

Succinctly, constructivism avers that learners construct their own reality or at least interpret it based upon their perceptions of experiences, so an individual's knowledge is a function of one's prior experiences, mental structures, and beliefs that are used to interpret objects and events (pp. 34-35).

Constructivism has been further divided into cognitive and social spheres. Cognitive constructivism refers to individual learning processes and "maintain[s] that individuals develop their own models of reality using personal experience and research-based data (Whitman, 1993, p. 517).

Social constructivism focuses on communication and "maintains that individuals use their membership in a community to continually refine and shape" models of reality (Whitman, 1993, p. 517). Essential elements of social constructivism in education are collaboration and peer teaching. It focuses on the exploration of multiple perspectives in a real world environment and assumes that learning occurs among persons rather than between a person and things (Whitman, 1993).

The common elements of these multiple theoretical frameworks underpin the concepts behind and the application to effective teaching and learning experiences for health education.
Effective Teaching and Learning Experiences

Ramsden (1992) suggested that improvements in teaching can be realised through understanding how students learn and the focus should be on "the best ways to teach students in relation to what we know about how they learn actual subject matter in the everyday setting of classes and assessment" (p. 7-8). Duffy and Cunningham (1996) have explored the implications of the design and delivery of instruction to develop a list of seven "metaphors we teach by" as basic assumptions for design.

- All knowledge is constructed: All learning is a process of construction.
- Many world views can be constructed: Hence, there will be multiple perspectives.
- Knowledge is context dependent, so learning should occur in contexts to which it is relevant.
- Learning is mediated by tools and signs.
- Learning is an inherently social-dialogical activity.
- Learners are distributed, multi-dimensional participants in a sociocultural process.
- Knowing how we know is the ultimate human accomplishment.

Specific to health education, Greene and Simons-Morton (1984) discussed assumptions about the learner to be considered in the selection of teaching and learning strategies. Those assumptions included:
- The learner is motivated and teaching strategies should work with the learner's existing motivations.

- The learner actively participates in learning activities when they are provided with some assurance that their self-concept will be enhanced and their self-esteem will not be threatened.

- The learner is an expert on her/his own health behaviour and for most health-related subjects, learners already hold beliefs, attitudes and values towards health.

- There are individual differences between learners that include capabilities, previous learning, and learning style.

Read and Greene (1980) suggested health education afforded a great outlet for creative teaching and learning. Further, Read and Greene (1980) argued that effective teaching and learning strategies for health education must be designed and implemented "in a vital, imaginative way in an atmosphere that will encourage uninhibited discussion and introspection" (p. 102). Whitman (1993) suggested that factors related to the individual learner included independence and active involvement (i.e., learner responsibility for their her/his learning).

Rather than deciding what learners should know and providing instructional activities to present this knowledge, teachers should select problems relevant to the learners and provide tools to understand and solve these problems. Thus, a goal of education should be to form a partnership between teacher and student in which the teacher helps the learner complete tasks with increasing levels of independence (p. 518).

Greene and Simons-Morton (1984) explained that the teaching and learning process in health education was an interactive one in which both the learner and the health educator were responsible for the learning communication. Health education
literature calls for learner-centred approaches such as small group work, cooperative learning, peer teaching, open-ended questioning, idea sharing and reflection. Additionally, it was suggested that this occur within learning environments that provided a climate of acceptance that allow for opportunities to build a sense of self-efficacy (Greene & Simons-Morton, 1984; Hendry, Shucksmith, & Philip, 1995; O'Connor & Parker, 1995). Romiszowski (1997) agreed that most of the techniques known to develop higher-order thinking skills involved "small-group interaction, in-depth discussion, a lot of interchange of ideas between the participants, an approach to the conduct of the teaching/learning activity that is flexible, collaborative, and conversational" (p. 29). He also noted that the term 'experiential learning' was often associated with such teaching and learning techniques. Thus, there is consistent agreement in the literature on the benefits of learning through discussion and collaboration.

**Collaborative Learning**

The literature argued for the educational benefits of collaborative learning activities. Teaching and learning strategies that included collaborative group work allowed learners to share and challenge alternative points of view (Duffy & Cunningham, 1996). In their review of the literature regarding small group teaching and learning implementations, Brown and Atkins (1991) found peer group teaching and learning situations increased participation and developed students' responsibility for their own learning. Group learning originated from simply bringing learners together for discussion, exchange, interaction and mutual assistance. But to qualify as cooperative or collaborative, the process was structured to include: interdependent learner
interaction; learner commitment to the learning of each member of the group; learner commitment to fulfil assigned group functions; use of the appropriate social and interpersonal skills to stimulate cooperation; and continual revising of the group functioning process (Henri & Rigault, 1996).

Slavin's (1989) review of research which focused on cooperative learning concluded that cooperative learning was statistically significant in facilitating academic achievement in 57% of more than 70 studies reviewed. Thirty-four of 41 studies that involved a student-team-learning approach found significantly positive achievement results (Slavin, 1989). Laurillard (1993) confirmed that "studies of student-student interaction are universal in their enthusiasm for the richness of the interactions produced, and the potential they offer for learning to take place" (p. 172). However, it was further noted that such studies often recognised that the learning interactions were not always successful (Laurillard, 1993).

Laurillard (1993) provided cautioned support for collaborative learning. It supports the communication of the student's point of view; it is controllable by the student; it supports interaction at the level of description, although the fact that the feedback offered on a student's description is from another student, and not from a teacher is a significant difference (p. 172). Thus, Laurillard (1993) suggested that student-to-student discussion was "an excellent partial method of learning that needs to be complemented by something offering other characteristics..." (p. 172).

This review of literature pertaining to the theoretical basis and range of pedagogical strategies related to health education provided a basis to the design of learning.
activities and learning environments developed in this investigation. With this foundation, an exploration of the potential of the World Wide Web for facilitating effective pedagogical strategies was conducted.

**Web-based Learning Environments**

The literature proposed that the technological advances of the World Wide Web will have a profound impact on the nature of teaching and learning. Khan (1997) claimed that Web technologies had the "ability to provide rich learning environments in a global, democratic, and interactive manner" (p. 8). Wilson (1995) referred to a learning environment as a metaphor for instruction which included the learner and a setting or space within which the he/she acts. Within this setting the learner uses tools and devices, collects and interprets information, and interacts with others. Wilson (1995) further explained that students provided with generous access to information resources (such as texts, images, videos and databases) and tools (such as search engines, word-processors, and communication devices) were likely to learn something if they were also provided with appropriate support and guidance. The development of the World Wide Web allowed for the provision, accessibility and, most importantly, the functional and conceptual integration of such resources, tools and devices.

Much has been made of the instant and unlimited access to information resources made possible by the Web (Khan, 1997). In reference to the uniqueness of the nature of those resources, Relan and Gillani (1997) explained that the content has become more varied and dynamic; learners are not limited to static texts. This point was of
critical importance to the field of health education due to the rapidly changing knowledge-base influenced by health research.

Hyperlinks and tools such as search engines have allowed learners to explore such information resources in any way that might suit their needs at any given time (Khan, 1997; Nguyen, Tan, & Kezunovic, 1996). Conversely, some argued that the nature of hyperlinks and Web search tools caused learners to get 'lost in cyberspace' and be overwhelmed with information (Godfrey, 1996; Nguyen et al., 1996). However, such a view disregarded the benefits of multiple representation, learner control and independent inquiry in the process of constructing understanding — a concept supported by proponents of the process of learning with hypermedia/multimedia (Jonassen et al., 1997; Jonassen, M, & McKillop, 1996; Jonassen & Reeves, 1996).

An important feature of the development of Web for higher education was the opportunity for flexibility (Nguyen et al., 1996). While traditional learning environments were limited by physical boundaries, the Web extended those perimeters of learning such that learners could engage at a time and location convenient to them. In the facilitation of constructivist learning, this access to "a multitude of learning resources regardless of one's geographical location allows continuity in learning and encourages uninterrupted reflection about a topic, and revision of one's thesis" (Relan & Gillani, 1997 p. 43).

This concept of the capability of the Web to go beyond what is possible within the confines of the classroom was further discussed in terms of facilitating constructivist learning. The literature argued that effectively designed Web-based learning
environments promote authentic learning (Bonk & Reynolds, 1997; Kearsley, 1996; Khan, 1997). Relan and Gillani (1997) suggested that Web-based learning environments can be employed to encourage experiential learning such that the learning process was integrated with the real world.

The accessibility of international information resources and the capability for teachers and learners to interact through communication tools with experts and peers worldwide via the Web allows for a cross-cultural perspective (Khan, 1997). As such, the Web inherently facilitates the exploration of topics from multiple perspectives — a crucial component of the learning process particularly in the discipline of health education. Thus, the power of Web technologies to facilitate communication and collaboration among learners was seen to be of particular importance.

Learning collaborations within Web-based learning environments were made possible though communication devices. The emergence of computer-mediated communication (CMC) predated the emergence of the World Wide Web. However, advancements in Web-based technologies allowed individuals and groups of people to communicate within 'user-friendly' environments (i.e., a user is no longer required to understand complex computer languages and/or commands in order to interact with other users via a computer). Kushner, Watson, and White (1997) suggested that the Web has been the fastest growing type of computer-mediated communication. Consequently, exploration of issues that emerged from CMC research was necessary for an understanding of the educational potential of the Web particularly with respect to learner interaction and collaboration.
Romiszowski and Mason (1996) provided a working definition of computer-mediated communications (CMC) as "communication between different parties separated in space and/or time, mediated by interconnected computers" (p. 439). CMC has been researched and implemented in the educational setting for more than a decade. This research provided insight as to what educational benefits might be realised when the communication capability of the Web was harnessed for teaching and learning purposes. As Harasim, Calvert and Groeneboer (1997) explained "Analysis of data collected over ten years of application of this approach… [indicated] outcomes such as active participation, peer interaction, multiple perspectives and divergent thinking" (p. 150).

There has been some debate regarding the impact of the visual cues of face-to-face learning environments that are absent from computer-mediated situations. In one respect, the literature has suggested that learning collaborations within CMC environments can be as powerful, or even more so, than face-to-face encounters. In their review of the literature regarding the social impact of CMC, Romiszowski and Mason (1996) highlighted the findings that such technologies allowed for genuine facilitation of human communication and learners were able to develop relationships regardless of the reduced cues.

Consideration of what Rheingold (1993) has referred to as the filtration factor of CMC environments has been seen to be important. A CMC situation,
... prevents people from communicating the facial expression, body language, and tone of voice that constitutes the inaudible but vital component of most face-to-face communications. Irony, sarcasm, compassion, and other subtle but all-important nuances that are not conveyed in words alone are lost when all you can see of a person are words on a screen" (p. 71).

However, participants within CMC environments have invented communication techniques to overcome the reduced visual cues (Paccagnella, 1997; Rheingold, 1994). For example, Rheingold (1994) observed that, when the usual social conventions of the physical environment were absent and participants interacted in a world stripped of the nonverbal context, they recreated context by using words to describe how they would act and/or how the environment would appear. Furthermore, it was noted that while CMC environments encouraged both positive and negative 'dis-inhibition', groups established their own sets of taboos and social control mechanisms to both exploit and control phenomena inherent within interaction in such a medium (Rheingold, 1994). Therefore, absence of nonverbal context, particularly with respect to personal physical characteristics such as gender, age, and race in CMC situations, has provided the potential to facilitate effective learning environments.

Through analysis of learner interactions within CMC environments, researchers have observed equality in participation as opposed to the social inequality and unequal participation that have been viewed in face-to-face group interactions (Romiszowski & Mason, 1996). Studies of CMC implementations in the university setting have shown that most learners contribute actively and that the distribution of communication (i.e., the amount of input) is spread quite evenly among the learners (Harasim, 1993; Romiszowski & Mason, 1996). Generally, it has been found that students who tend to participate less frequently in face-to-face, classroom situations
contribute much more in on-line learning situations (Bellman, Tindimubona, & Arias Jr, 1993; Goddard, 1996; Harasim, 1993; Ruberg, Taylor, & Moore, 1996b). Harasim (1989) noted that much of the verbal inputs during class time in the face-to-face learning environment came from the teacher while, in the on-line environment, this pattern was reversed. Furthermore, it was found that the typical face-to-face classroom discussion was dominated by one or two students while the rest remained silent. Conversely, a more equitable pattern of communication among class members occurred in the CMC environment (Harasim, 1989).

Valacich, Dennis, and Nunamaker (1992) reviewed literature related to group interaction process and found that significant inhibitors to verbal, face-to-face interaction included production blocking, free riding and evaluation apprehension. *Production blocking* referred to the condition of the face-to-face environment where only one participant was able to speak at one time. As such, participants were prevented from expressing their ideas as they occurred, forgot or suppressed their views. Furthermore, while participants waited to contribute they often focused on remembering their idea rather than generating or reflecting on the idea presented (Valacich et al., 1992). *Free riding* referred to the "tendency of some group members to rely on other members to accomplish the task without their contributions" (Valacich et al., 1992, p. 52). *Evaluation apprehension* referred to the fear that negative feedback or evaluation of contributions caused individuals to withhold ideas (Valacich et al., 1992). While CMC environments alleviate some of these inhibitors of the face-to-face environment, these issues may be transferable to on-line collaborations.
CMC environments have been found to be particularly beneficial in facilitating participation for mature-aged, female, handicapped students and for those who are normally quiet in classroom situations (Bellman et al., 1993; Goddard, 1996; Harasim, 1993; Ruberg et al., 1996b). Bellman et al (1993) provided further interpretation regarding the experience for female participants:

In face-to-face interactions, women are often forced into a facilitation role and many times lose turns to speak in conversation with men... In computer-mediated discourse, women are able to express themselves much more easily and fully without being interrupted or ignored" (p. 240).

The literature provided some cautions on the use of CMC in the educational context such as the potential for information overload for the learner and difficulties experienced when discussions drift off topic (Harasim, 1987, cited in Romiszowski and Mason, 1996 #94; Romiszowski & Mason, 1996). However, the literature has emphasised the key factors in the learning process that are facilitated by CMC learning environments, especially those that involved asynchronous interactions between learners. The opportunities for reflection, learner control and self-directed learning provided for by asynchronous CMC have been important points of discussion (Laurillard, 1993; Romiszowski & Mason, 1996). As Teles (1993) has explained:

Asynchronous communication, that is the opportunity to interact with others on one's own time, gives the learner the flexibility to research or to use metacognitive strategies to address issues raised by peers or mentors and to have the time to research and to reflect before responding. This is different from face-to-face learning interaction when an immediate response is expected (p. 276-7).

This has been demonstrated in studies where learners perceived the opportunity to engage in independent research on a topic and reflect on the learning task as factors that contributed to learning in the on-line setting (Simoff & Maher, 1997).
Asynchronous CMC learning strategies provided for a high level of learner control in that they allowed for the learner to participate in topic negotiation in terms of what topics were discussed, the number of topics discussed and the speed at which communication about topics occurred (Harasim, 1987, cited in Romiszowski and Mason, 1996; Laurillard, 1993; Romiszowski & Mason, 1996).

It has been suggested that subjects that can be explored through pedagogical strategies such as discussion, brainstorming, collaboration, problem solving and reflection were well suited for CMC environments (Wells, 1992, cited in Romiszowski and Mason, 1996). Therefore, it would seem that the study of health education might be effectively facilitated in a Web-based learning environment that includes learning activities focused on learner communication and collaboration.

Exploration of the components of Web technologies and outcomes of computer-mediated communications in earlier networked learning environments suggested that Web-based learning environments have the potential to facilitate the application of educational theory with the selection of appropriate teaching and learning strategies.

**Studies Similar to the Current Study**

Much of the research and evaluation of educational technology — specifically, Web-based teaching and learning — is concerned with issues of interface design or experiences of the "early adopting" teacher rather than focused on the learning experience or learning outcomes. As previously mentioned, few studies have been conducted to provide adequate research evidence that demonstrated the effectiveness of Web-based instruction (Reeves & Reeves, 1997). Schutt (1997) expanded on this
concern regarding the growth of significant implementation of Internet and/or Web-based teaching and learning activities.

Yet little, if any, experimental evidence has been generated to demonstrate the effects of virtual versus traditional class format on student performance. What has appeared is largely qualitative and/or anecdotal. What quantitative data do appear tend to be based on a single class (and hence, no experimental comparison) or self-selected samples of two or more classes. Considering the amount of money being expended in higher education on infrastructure, software, training and technological pedagogy, this lack of experimental evidence is unconscionable (quoted from hypertext document).

The dearth of research was particularly evident in the area of health education where available literature failed to go beyond descriptions of proposed implementations or initial experiences (Mauldin, Cullum, & Ross, 1997). However, previous research that has focused on collaborative learning, networked learning, computer-mediated communications, and more recently, Web-based teaching and learning informed the design, implementation and analysis of this investigation.

**Facilitating Knowledge Construction and Attitude and Behaviour**

**Change**

The literature included few studies that provide quantitative measurement of learning outcomes in Web-based learning environments. Schutte (1997) compared learning outcomes related to a social statistics subject in which students were randomly divided into two groups: One taught in a traditional classroom and the other taught virtually on the World Wide Web. Similar to the current study, text, lectures and exams were standardised between the conditions. Contrary to their proposed hypotheses, quantitative results demonstrated that the virtual class scored an average of 20% higher than the traditional class on both examinations.
Nature of Participation in Learning Activities

A number of studies provided insight as to how learners might participate in collaborative learning activities in both face-to-face and Web-based learning environments. Sproull and Kiesler (1993) conducted a series of experiments that compared small group decision-making through computer conferences, e-mail and in face-to-face discussions. The studies found that while computer-mediated communication induced participants to talk more frankly and equally and facilitated more proposals for action, CMC groups took longer to reach decisions than face-to-face groups. Ruberg, Taylor and Moore (1996a) suggested that the nature of on-line interaction for students was affected by factors related to student awareness of each other and the position each held with his/her peers and the teacher when there was a face-to-face component within the subject. However, they noted that the pattern of on-line interaction did not mirror face-to-face situations:

- Students who were the most frequent participants in the traditional classroom setting tended to be the most frequent on-line participants (although this was consistently found in every discussion).
- Many of the students who rarely or never participated in the face-to-face class were average or more than average participants in the on-line discussions.
- Students who were rated as infrequent participants in the traditional class became more frequent participants in the on-line environment.
- The least frequent participant on-line was also described as an infrequent to rare participant in the traditional classroom (Ruberg et al., 1996b).
In an investigation of how Web-based support materials and open-ended inquiry based activities encourage collaboration and influence learners' cognitive processing and engagement, Oliver, Omari and Herrington (1997) found that expository interactions rarely materialised whereas a high level of procedural interactions were observed. They concluded that learners' unfamiliarity with the environment might have contributed to such results. Thus, it was recommended that the design of Web-based pedagogical strategies include: careful planning of group composition; requirement that learners provide feedback on their outcomes in order to maintain focus and ensure completion of learning activities; introduction of learning activities after the learners have become familiar with the Web environment; and employment of more adaptive forms of scaffolding for selective assistance.

**Perceptions of Learners**

Studies that have investigated learners' perceptions have consistently found positive responses regarding the general issues associated with on-line learning (Graham & Scarborough, 1999; Jonassen, Previsch, Christy, & Stavrulaki, 1999; Macpherson, Bennett, & Priest, 1997; Oliver & Omari, 1999). In their exploration of on-line problem-based learning employed with a group of on-campus students in an undergraduate university course, Oliver and Omari (1999) found that students responded positively to the learning environment and perceived that problem-based activities contributed substantially to their learning and enjoyment in the course. This finding was consistent with a number of studies that also found that learners' perceived on-line or Web-based learning environments as facilitating their
understanding of and positive attitude toward the subject (Naidu & Olsen, 1996; Schutte, 1997).

On-line and Web-based learning posed unique challenges for learners. Such challenges put forward in the literature included: motivation of the learner, degree of acceptance both student and teacher, learner's prior knowledge of content, attitude toward technology, level of content, degree of interactivity, amount of difficulty in using the system, ease of accessibility to the system, and teacher and student ability and availability to communicate (Campbell & Yong, 1996; Cornell & Martin, 1997; Schrum, 1997).

These issues were also found to be important in an implementation of on-line learning in an educational technology course in the institution in which the current study was conducted (Corrent-Agostinho and Hedberg, 1998). In this investigation, students reported lack of motivation to participate, procedural confusion (i.e., when to sign on) and technical difficulties as issues to be reconciled for on-line learning. It was also interesting to note that students have reported on-line and Web-based learning to be more time-intensive than face-to-face situations (Ruberg et al., 1996a; Schutte, 1997).

The time consuming nature of learning within the on-line or Web-based environment may be related to the opportunity for reflection. The findings of previous CMC research regarding learner reflection have carried through as networked technologies advanced to Web-based environments (Naidu & Olsen, 1996; Ruberg et al., 1996b).
Development of Attitude Toward Using Computers and the Web

While the development of computer and Web skills and attitude toward using computers was not an objective of the health education subject involved in the investigation, integration of computer technologies across disciplines has been an important issue for teacher training (Ministerial Advisory Council on the Quality of Teaching, 1998). Researchers have found that use of computers — specifically, networked technologies — does have an impact on learner's attitude toward using computers (Ruberg et al., 1996b).

Summary

This chapter provided a summary of the literature pertaining to the nature of health education, the potential teaching and learning strategies that could be utilised for health education, the components and potential educational benefits of Web-based learning, and studies similar to this investigation. There was general consensus in the literature that learning, particularly as it is related to health education, was a process that included cognitive, affective and social aspects. There was also agreement that the learning process is effectively facilitated within learner-centred environments that catered for reflection, learner control, authenticity, discussion, collaboration, and the exploration of multiple perspectives. The literature also provided theoretical and some research-based support for the potential of the Web to facilitate learning. Recent research similar to the current study suggested:

- Measured learning outcomes could be realised though Web-based learning environments.
- The nature of the collaborative interactions may be different between face-to-face and Web-based learning environments.
• More equality in participation may occur in the Web-based learning environment.
• Groups may take longer to reach consensus in the Web-based environment.
• There may be a number of challenges for learners engaged in the Web-based environment.
• The use of the Web-based learning environment may have a positive impact on computer skill development.

This review of the literature was used as a foundation for the development and implementations of the investigation.
Overview of the Chapter

The first phase of this research study involved the design and formative evaluation of the learning activities and Web-based learning environment that was implemented in the subsequent experimental phase of the investigation. Specifically, this phase involved:

- Reconceptualisation of the pedagogical structure of the tutorial component of the subject.
- Development of specific learning activities.
- Design and development of a Web-based learning environment to support the subject and facilitate the learning activities.
- Formative evaluation of the environment with embedded learning activities.

Subject Description

The subject entitled, *Health and Health Behaviour* (University of Wollongong subject code *EDUP144*) was selected as the focus for the study. *EDUP144* was chosen as an appropriate subject in which to investigate the learning outcomes associated with collaborative learning activities and the use of a Web-based learning environment for a number of reasons. History demonstrated that, among students enrolled in this subject, there was typically a range of computer experience from novice to experienced users. This allowed for a measure of the true impact of the Web-based learning environment on outcomes for a typical student cohort. Most importantly, the content covered within the subject included a range of both cognitive and affective factors related to such topics as disease, nutrition, and health behaviour and therefore
allowed for the utilisation of collaborative learning activities for which knowledge
collection, attitude and behaviour change could be evaluated.

EDUP144 was a core health subject within the Bachelor of Education (Physical and
Health Education) degree program offered by the Faculty of Education. The subject
was typically offered over 14 weeks in the second session of the academic year.
EDUP144 served as the precursor for a sequence of subjects which examined the
major issues inherent in health and society within this degree program. This pre­
service teaching course was intended to provide academic and professional training
for those who wished to be employed as teachers within the areas of physical
education, health education and personal development. While students from faculties
other than Education elected to engage in this subject, the majority of enrolled
students tended to be in their first year of this Bachelor of Education program.

The desired learning outcomes in this subject were for students to have:
- identified and described aspects (e.g., aetiology, risk factors, modes of
  transmission, and epidemiology) of specific chronic, degenerative, communicable,
  and infectious diseases;
- identified and described issues (e.g., essential nutrients, healthy eating, dietary
  guidelines, eating patterns, weight management, and eating disorders) related to
  nutrition;
- described themes of health behaviour and health behaviour theory; and
- discussed issues of personal choice, attitude and behaviour related to specific
diseases and health issues and practices.
The complete description of the subject and the related learning outcomes can be found in Appendix A.

Traditionally, the format of EDUP144 consisted of a weekly two-hour lecture and a one-hour tutorial. The tutorial component of the subject involved a classroom-based seminar format for classes of twenty students where sub-groups of two or three students worked on one specific topic related to the subject content for presentation during the scheduled tutorial. Typically, students actively investigated only their assigned topic area and were less involved in the exploration of the topics presented to them in tutorial by other student groups.

While this learning strategy has been utilised in higher education for a number of years, it has come under criticism for some time (Jaques, 1991; National Union of Students, 1969; Webb, 1983). Some often-cited problems experienced by students engaged in this type of seminar format included discussions dominated by one or two students, insufficient preparatory work by participants, and lack of voluntary initiation of contributions to discussion by students. As Jaques (1991) explained, although the theory of the seminar format group learning experience was to facilitate the interchange of ideas and stimulate critical thinking, "in practice, the dynamics of the group and the way tutors commonly handle it make this technique an unsatisfactory experience for many students" (p. 91). In his study of participation patterns within undergraduate tutorials, Webb (1983) found that tutors tended to monopolise the majority of tutorial time while students spent most of the tutorial time passively listening.
Furthermore, in literature related to educational technology concern has been raised that "many adopters of new technologies such as the World Wide Web have as their primary focus, the features of the new technology" (Alexander, 1995, quoted from hypertext document). The argument was expanded to include the view that instructors should first be on identifying the important topics and concepts of the subject for students to learn, the educational goals, and what is known about the students and how they learn. Only then, it has been argued, can instructors explore a number of teaching and learning strategies (technological and/or non-technological) that might facilitate learning (Verdejo, 1996). As Alexander (1995) cautioned:

We should decide to use technologies such as multimedia or the World Wide Web only when that use provides new opportunities for students to learn - to visualise, to understand, to see complex relationships in ways that are not possible using any other media" (quoted from hypertext document).

Thus, the facilitation of effective learning experiences, regardless of the nature of the learning environment (i.e., face-to-face or Web-based settings), will continue to be dependent on the delineation of educational objectives, understanding of the nature of the learner, and exploration of strategies to nurture the learning experience.

Given this context, a reconsideration of the traditional seminar-format tutorial activity for the subject was undertaken prior to testing the efficacy of the Web for this particular health education subject.

The coordinator of EDUP144 first developed the subject five years ago. The subject coordinator has taught physical and health education at the secondary and tertiary level for more than 30 years and has been actively involved in curriculum development for the New South Wales educational system. The subject coordinator
was actively involved in the pedagogical redesign and development of specific learning activities for this research investigation.

**Revised Pedagogical Strategy**

The constructivist approach to learning viewed learning as a continuous process that involved internalising external experiences — particularly language experiences (Vygotsky, 1978). As Duffy and Cunningham (1996) explained, "... learning becomes a social, communicative, and discursive process, inexorably grounded in talk" (p. 181). It was argued that dialogue and discourse encouraged the higher-order thinking skills of cognitive conflict and resolution in providing context and a mechanism for explanation, justification and reason (Oliver, Omari, & Herrington, 1997). The notion that discussion has value for the learning process is a factor for the use of discussion-based learning strategies and collaborative learning environments. Learners' interactions with teachers and other learners "give them perspective, place them within a community of learning, and contribute to their mastery of concepts and skills" (Price & Petre, 1997, p. 869).

The literature argued that learners effectively engage in knowledge construction and attitude and behaviour exploration when they perceive relevance in the learning activity, are presented with new information, are presented with messages in a credible manner, are involved with the planning, production or delivery of the learning activity, participate in post instruction discussion, and experience "purposeful emotional involvement" (Simonson & Maushak, 1996, p. 1001). Learner-centred approaches such as collaborative group work, cooperative learning, peer teaching, open-ended questioning, idea sharing and reflection facilitate learners' sharing and
challenging alternative points of view (Duffy & Cunningham, 1996). It was suggested that such approaches occur within learning environments that provide a climate of acceptance and facilitate opportunities to build a sense of self-efficacy (Hendry, Shucksmith, & Philip, 1995; O'Connor & Parker, 1995).

Based on the literature, the pedagogical strategy for the tutorial component of the subject was reconceptualised for implementation in both face-to-face and Web-based learning environments with the assumption that both environments could facilitate improved health education learning outcomes. The redesigned strategy consisted of task-based collaborations undertaken by learning groups which consisted of four or five students. In each tutorial session, learning groups were presented with material designed to stimulate discussion and collaboration (e.g., a survey to be answered, questions to be considered, etc.). The objective for the learning groups was to develop a consensus or shared understanding which had the potential to enhance knowledge, attitude and behaviour and that was then communicated to the larger class during the subsequent lecture period. This feedback strategy was considered especially important in terms of the implementation of the Web-based learning environment. Ruberg, Moore and Taylor (1996a), in their investigation of collaborative peer review and analysis activities within a computer-mediated environment, found on-line collaboration was best supported when integrated into the context of subsequent face-to-face activities.

Figure 3.1 illustrates the pedagogical model developed. The learning strategy involved a task which provided stimulus for an authentic activity where learning was potentially enhanced through working on the task (Duffy and Cunningham, 1996).
Each activity was designed such that the group collaboration could be carried out in both face-to-face and Web-based environments.

![Diagram]

Figure 3.1: Model of pedagogical strategy used in tutorial component of subject.

**Learning Activity Development**

The issues of health status and health behaviour were continuing themes throughout the subject, with specific health topics related to these themes brought into focus. The first half of the subject session centred on classification, epidemiology, risk factors and modes of transmission associated with a number of degenerative and communicable diseases. The second half of the subject session dealt with diet and nutrition as it related to specific populations, weight control, disease, and athletic performance.

The redesigned tutorial activities were implemented for all tutorial topics covered through the subject (i.e., within a face-to-face learning environment). For the purpose of the research investigation, six activities were developed for delivery in both the face-to-face and Web-based learning environments. A set of criteria was developed to
identify the topics to be delivered in both environments. The criteria necessitated that the health topic covered both cognitive and affective issues, had the potential to generate discussion among students, and included issues on which students might hold a range of views.

Using this criteria and a description of the health topics covered in the subject, specific topics for use within the research investigation were selected through a process which included a focus group conducted with physical and health education lecturers.

From the topic areas in the first half of session, HIV/AIDS was determined to be the most appropriate for the purposes of the research study. Concurrent face-to-face and Web-based learning activities included (1) modes of transmission of HIV/AIDS, (2) risk factors associated with HIV/AIDS, and (3) behaviour change associated with HIV/AIDS.

The selected topics for the research study during the second portion of session were: (1) food facts including nutrients, food groups and recommended daily intake, (2) food choices including healthy eating and behaviour change, and (3) body shape and body image.

Subsequently, development of the learning activities that were utilised in both the face-to-face and Web-based environments commenced. This process included review of subject objectives, conduct of a focus group session with health education and educational technology lecturers within the Faculty of Education, consideration of
past practices and experiences of the subject lecturer, review of topic-related teaching resource kits, and identification and evaluation of topic-related Web sites.

Web-based Learning Environment Development

Once the pedagogical strategy was reconceptualised and the specific learning activities were developed, the Web-based learning environment was designed and constructed. Guiding factors in the design of this Web-based learning environment were assumptions regarding the computer and Web skill level of the prospective students. Based on experience with similar cohorts, it was expected that there would be a range of computer skills among the students with the majority having only beginner level experience using computers. Additionally, it was expected that there would be a range of Web skills with the majority of the students having either none or little experience in using the Web.

The primary function of the subject Web site was to support and facilitate the Web-based tutorial learning activities. The secondary function of the Web site was to provide access to the subject outline and schedule and to resources (such as links to external Web sites) pertinent to the subject topics.

The guidelines for the design of constructivist learning environments available in the literature were consulted to develop learning environments utilised in this study. Lebow (1993) explained that "rich environments for active learning included "collaboration, personal autonomy, generativity, reflectivity, active engagement, personal relevance, and pluralism" (p. 5). With reference to design of educational Web sites, Brown and Thompson (1997) argued for, "ease of navigation, a sense of
human interaction, helpfulness and responsiveness to the needs of learners studying in an information rich, self-directed medium" (p. 78). Orey and Nelson (1993) cautioned educational Web site designers "to remember that the learner will not only be learning the content, but will also be learning how to use the software; therefore, ease of use should be one of the primary considerations in designing a user interface" (p. 61). Accordingly, particular attention was paid to constructing a subject Web site with a simple structure. Collis, Andernach and Van Diepen (1997) found that Web-based learning environments could be structured to help learners overcome the problems that were commonly found in group-based project work. The following suggestions were considered in the design of the $EDUP144$: Health and Health Behaviour Web site:

- All aspects of the course, theoretical and project-related, should be integrated into a single subject Web site.
- Student work should linked to the subject site for use as examples and self-study material.
- Learning tasks in which the common product is motivating and a group approach is required should be selected.
- The selection of Web-tools with shared space where work and notes are viewable by all learners is an important component.

Finally, Web site structure was based on the primary and secondary functions for the learning environment (i.e., to facilitate the Web-based tutorials and provide access to subject information and resources) and was represented in the subject home page (see Figure 3.2) with four main components:
- The *Subject Outline* provided information such as the rationale, objectives, content, presentation, assessment, and participation expectations for the subject.

- The *Subject Schedule* provided, in table format, the week-by-week timetable of lecture topics and tutorial activities.

- The *Resources & Web Links* included links to a number of Australian and international Web sites related to the topics covered in the subject.

- The *Activity Centre* facilitated the learning activities for the students participating in Web-based tutorials.

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**Figure 3.2: Prototype subject Web site home page.**

Using graphics and clip art made available in Web site authoring software and/or Web sites, icons were designed to represent the four main areas of the Web learning environment. These icons were replicated at the top left corner of the corresponding...
page to act as a visual cue to the Web site area in which the students were exploring.
The icons also appeared in a navigational menu bar at the bottom of each page (see Figure 3.3). This menu bar was constructed to allow the student to move to any area of the site.

![Prototype subject Web site navigation bar.](image)

Figure 3.3: Prototype subject Web site navigation bar.

The external links in the Resources and Web Links page were chosen for relevance to the topics covered by the subject, accuracy of information, interactivity, and availability of Australian and international sources. Links to external Web sites were sorted by topic and annotations were provided for each link to inform the student about the content of the external site.

To facilitate the tutorial learning activities within the Activity Centre, a number of Web-based communications tools (such as Interaction and TopClass™) were considered through literature review and testing activities (such as in Juell et al, 1996). The criteria used to review these tools included the previously stated assumptions regarding the computer and Web skills of prospective students. Ruberg, Moore, and Taylor (1996a) have noted the frustration experienced by students in learning new software commands in order to participate in group discussions. It was determined that FileMaker Pro™ databases could be used to construct a tailored learning environment that allowed students to access the learning activities and
interact with their learning group members with only minimum Web browser competency level required. This system allowed for both a seamless discussion space which students could utilise in either synchronous or asynchronous fashion as well as a password control mechanism into the Activity Centre.

The Activity Centre was designed based on the suggestion by numerous authors that Web-based learning environments put minimal cognitive load on the student (El-Tigi & Maribe Branch, 1997; Orey & Nelson, 1993). It was suggested that templates be utilised in screen design, which promoted "understanding by allowing the reader to focus on new information rather than devoting time and energy to variations of format" (El-Tigi & Maribe Branch, 1997, p. 25). The initial structure of each activity consisted of two or three Web pages a Things To Do page, a group members Results page (in cases were a questionnaire served as a basis for group discussion), and a Discussion Area. Using graphics and clip art made available by Web site authoring software — Web sites that provide free-to-use clip art and curriculum resource kits (National AIDS Campaign, 1995) — a single graphic was developed and placed at the top left corner of the page as a visual cue for students engaged in a particular learning activity.
The *Things To Do* page (see Figure 3.4) outlined the activity and provided stimulus for the group discussion. Examples of discussion stimuli utilised in the learning activities were a questionnaire (e.g., In what situations can HIV be transmitted?) to be answered and discussed by the group, a narrative that provided an example for groups to develop their own story (e.g., for risk factors of HIV/AIDS), and "ask the expert" questions that required a group response.

![Figure 3.4: An example of prototype Web learning activity *Things To Do* page.](image)

Figure 3.4: An example of prototype Web learning activity *Things To Do* page.
In cases where a questionnaire provided stimuli to the collaborative learning activity, responses of the individual group members were provided on a separate page (see Figure 3.5). This was designed to facilitate the sharing of ideas among group members and to provide a basis for their discussion.

---

<table>
<thead>
<tr>
<th>(1) Having a blood transfusion in Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jon says: Yes</td>
</tr>
<tr>
<td>John says: No</td>
</tr>
<tr>
<td>Barry says: No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(2) Being cried on by a person with HIV?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jon says: No</td>
</tr>
<tr>
<td>John says: No</td>
</tr>
<tr>
<td>Barry says: No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(3) Hugging and kissing a person with HIV?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jon says: Yes</td>
</tr>
<tr>
<td>John says: Not Sure</td>
</tr>
<tr>
<td>Barry says: No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(4) Treading on a needle with HIV-infected blood in it?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jon says: No</td>
</tr>
<tr>
<td>John says: Yes</td>
</tr>
<tr>
<td>Barry says: Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(5) Sharing plates and cutlery with someone with HIV?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jon says: Yes</td>
</tr>
<tr>
<td>John says: No</td>
</tr>
<tr>
<td>Barry says: No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>(6) Having penetrative sex without a condom?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jon says: No</td>
</tr>
<tr>
<td>John says: Yes</td>
</tr>
<tr>
<td>Barry says: Yes</td>
</tr>
</tbody>
</table>

---

Figure 3.5: An example of the prototype Web site questionnaire Results page.
The *Discussion Area* (see Figure 3.6) for each activity was designed to be the focal learning area. The content of the page (i.e., discussion comments submitted by group members) was generated via the FileMaker Pro™ databases and ensured that comments were viewable only by group members. Comments were displayed in chronological order on the page and an input box for a new comment was placed after the last entry.

![Discussion Area](image)

Figure 3.6: An example of the prototype Web site *Discussion Area*. 
The development of the structure of the learning activities completed the construction of the prototype subject Web site (see Figure 3.7).

Once constructed, the site was mounted on a live Web server and tested for technical reliability. When it was determined that the site was technically stable, formative evaluation of the site was conducted.
Formative Evaluation Methodology

The purpose of the formative evaluation aspect of this investigation was to assess the potential pedagogical effectiveness of the collaborative learning activities and the design and useability of the Web-based learning environment.

Methodology

In their integrated evaluation model, Alexander and Hedberg (1994) proposed the need for formative evaluation in the design and development of technology-based learning environments (such as subject Web sites). At the design and development stage, formative evaluation can assess the effectiveness of the pedagogical strategy used and the appropriateness and functionality of the user interface. In this model, a variety of methods for the formative evaluation stage were proposed. These included literature review, walk-through prototype with potential users and experts, observation or user-tracking with potential users and expert, and peer and expert review. This integrated evaluation model has been endorsed as advantageous for the evaluation of educational innovations as it demonstrates how "close attention to the learning process and outcome should be threaded through all phases of evaluation" (Bain, 1999, p. 166).

Informed by the Alexander and Hedberg (1994) model, the formative evaluation of this prototype Web learning environment with embedded learning activities involved:

- review by experts in the areas of health education and educational technology;
- review by educational technology postgraduate students;
user testing by undergraduate teacher trainees of the Faculty of Education, University of Wollongong and by technical staff of the Interactive Multimedia Learning Laboratory.

**Expert Review**

Health education lecturers, educational technology lecturers and instructional designers were asked to participate in the expert review component of the formative evaluation. In total, 10 participants comprised the expert review panel (see Appendix B for list of review panel members). The four health education experts were lecturers at the University of Sydney or the University of Wollongong. Their teaching and research experience in the field of health education ranged between 10 and 25 years and all have participated in the development of secondary school health curriculum and resource material. The four educational technology experts were lecturers at the University of Wollongong or Edith Cowan University. Their teaching and research experience in the field of educational technology ranged between six and 20 years and all have been involved in the development of internationally recognised educational multimedia and Web-based projects with groups at their respective institutions. The two instructional designers were from the University of Wollongong and have been actively involved in the development of Web-based learning environments for postgraduate subjects in a range of disciplines.

Those who participated in the expert review process were provided with a letter (see Appendix C) which outlined the research being undertaken, the nature of the subject, the purpose of the Web site, instructions on accessing the Web site, and the
expectations of the review process. They were also provided with a list of questions to assist in their evaluation of the Web site and learning activities (see Appendix D). They were asked to review the Web-based learning environment in terms of structure and navigation, readability of text, appropriateness of graphics and icons, clarity and quality of information, and suitability of external links. They were also asked to critique the pedagogical effectiveness of the learning activities and comment on the clarity and perceived motivating and discussion-promoting characteristics of the activities.

One week after the distribution of this documentation, expert review participants were contacted and a meeting in which an in-depth interview could be conducted was arranged. The list of questions was used as a guide to the in-depth interview. While all reviewers were provided with and asked an identical list of questions, attention was given to eliciting in-depth feedback on the issues related to the field of expertise of the individual participants during the interviews. Interviews conducted with expert reviewers were audio-taped and transcribed.

**Peer Review**

A class of postgraduate students who were enrolled in the *Information Technology in Education and Training* subject, offered by the Faculty of Education, at the University of Wollongong, were asked to participate in the formative evaluation phase of this research study. The subject in which these students were enrolled involved an in-depth exploration of the use of the World Wide Web for educational purposes and the design, development and evaluation of educational Web sites.
This class of postgraduate students was introduced to the formative evaluation process and provided with a letter which outlined the research being undertaken, the nature of the subject, the purpose of the Web site, instructions on accessing the Web site, and the expectations of the review process (see Appendix E). They were given a form to complete and sign if they chose to participate in the formative evaluation process (see Appendix F). They were also provided with a survey which included an identical list of questions given to the expert reviewers to assist in the evaluation of the Web site and learning activities (see Appendix D). The postgraduate student reviewers were asked to complete and return the survey.

Of the 19 postgraduate students who agreed to participate in the review process, 14 returned completed surveys. These participants possessed a teaching background (which varied in terms of level and discipline) and focused their postgraduate studies on technology-based teaching and learning.

While the expert reviewers and postgraduate students were asked to comment on the potential pedagogical effectiveness of the learning activities, they were not asked to participate in and complete the collaborative learning activities themselves. However, in some cases, experts and students did participate in impromptu group discussions led by the learning activity tasks within the Web site Discussion Area. This not only tested the functionality of the Discussion Area but, more importantly, provided insight on the type of contributions that might be generated by students and therefore, an indication of the additional clarifications required in the descriptions of the learning activities.
Data collected during the expert and peer review process were collated by question and analysed to identify patterns in responses. Frequently suggested areas for enhancements to the learning activities and Web-based learning environment were identified and revisions were implemented accordingly. In cases where changes were made to specific learning activities, a selection of the health education experts were asked to provide further consultation on the perceived pedagogical effectiveness of the revised activities.

**User Testing**

Three classes of undergraduate students were approached to voluntarily test the Web site for usability. The focus of this aspect of the formative evaluation was to ensure that the site was technically sound and that the site structure, navigation, graphics, and information were clear. Students were provided with an instruction sheet and asked to complete a one-page survey (see Appendix G). Questions regarding use of the password, navigation within the site, their opinion on the layout, design, graphics, clarity of information and, ability to complete on-line questionnaires and make comments within the Discussion Area were included in the survey. Nine undergraduate students logged into and actively explored the Web site. Five students submitted complete surveys. Completed surveys were analysed with feedback regarding site structure, navigation, graphics, and clarity of information was considered in light of responses from expert and postgraduate student reviewers to similar issues.
Each participant in the formative evaluation was provided with an individual user name and password. During full implementation of the formative evaluation, the access control database contained at least as many users as it would during implementation of the Web site for the Health and Health Behaviour subject session. This provided an indication of the technical soundness of the database system.

With the assistance of 10 technical staff of the Faculty of Education's Interactive Multimedia Learning Laboratory, a further test of this Web site was conducted to ensure stability with multiple simultaneous users. Testers concurrently logged into the Web site, via dial-up and direct Internet connections, and actively explored links and made submissions to the on-line questionnaires and Discussion Areas. Participants in this useability test recorded all technical difficulties encountered on a paper-based log, which was collected at the conclusion of the test.
Formative Evaluation Implications

Based on the data collected through the formative evaluation process, frequently suggested areas for enhancement of the individual learning activities and Web-based learning environment were identified and revisions were implemented accordingly.

Web-based Learning Environment Interface

The majority of reviewers felt that the structure of the site was clearly recognisable (17 of 19 respondents). The reviewers noted that the site was "easy to follow", "distinctive and consistent", and "well planned and purposeful." The suggestion to add a note on the Resources & Web Links page to bookmark the subject Web site was incorporated.

Reviewers felt (17 of 19 respondents) that the site was aesthetically pleasing and specifically noted that the site had a "nice and simple" layout. Reviewers reported that the use of the background was unobtrusive and reduced screen glare. They felt that the consistent use of the background throughout the Web site provided a cue for users as they navigated within the site. Reviewers commented that the graphics included in the site were both simple and appropriate. They felt that the relatively short download time for graphics was a benefit for students who accessed the site via low speed computers and modems. Reviewers noted that icons were clear and intuitive but suggested the use of more "professional looking" graphics rather than those that were "clip arty." Consequently, icons that represented the four main areas of the site were designed to have a similar 'look and feel' and incorporated into
applicable areas of the site. The revised subject Web site home page illustrates such alterations (see Figure 3.8).

Figure 3.8: Home page of revised subject Web site.
Reviewers reported that they were able to move to different areas of the Web site without difficulty (17 of 18 respondents). Reviewers suggested some navigational enhancements which resulted in the development of a consistent five-button navigation bar with the icon relating to the page that the user was currently viewing, greyed out (see Figure 3.9).

![Figure 3.9: Navigation bar of revised subject Web site.](image)

Additionally, reviewers suggested a repetition of the links to the five main areas of the site across the top of each page alleviating the need to scroll to the bottom of the page to navigate to other areas of the site. As a result, the site navigation system was replicated, in a text-based format, at the top right corner of each page.

In terms of the general components, at the point of initial implementation within the EDUP144 subject, the Web-based learning environment consisted of the Subject Outline, Subject Schedule, Resources & Web Links, and Activity Centre. However, given the necessity to respond to the needs of the students engaged in the subject the Web site was enhanced during the course of subject delivery. For the first four weeks of the session, a current general notice was displayed on the subject home page directly under the buttons, which linked to the four main areas of the Web site.
Notices included such information as reminders of locations of tutorial rooms or computer labs. Through unsolicited feedback from students, it soon became apparent that retention of this information in a central location would be beneficial. The decision to add a Notice Board to the Web site was made during the fifth week of the session when the city of Wollongong experienced a flood and was proclaimed a natural disaster area for a period of one week. An announcement that University classes were cancelled was made only two hours prior to the scheduled start of the 8:30a.m. EDUP144 lecture. Most students did not hear the closure announcement through the media and some students braved the extreme conditions to attend the lecture. It was therefore decided that a Web site Notice Board would not only convey important procedural information about the subject but, would also convey the class culture through recognition of interesting events or actions engaged in by class members.

Additionally, students requested that the subject Web site include lecture notes. While the lecturer did not work from a prescribed set of notes, a Lecture Notes section was added to the Web site during the tenth week of session. This section consisted of an asynchronous discussion forum (generated by the FileMaker Pro™ databases used in the Activity Centre) in which students could post questions and responses regarding the issues covered in lectures. The subject tutor initiated the forum each week with a very brief description of the topics covered. The tutor also monitored the forum so that issues raised in the forum could be injected into subsequent lectures as necessary. Figure 3.10 depicts the Web site home page as revised for the inclusion of the Notice Board and Lecture Notes sections.
Figure 3.10: Web site home page used during subject implementation.
Learning Activity Structure

The original description for each tutorial learning activity included a list of group tasks. However, reviewers highlighted the need to clarify the parameters of the learning activity for students (i.e., expectations in terms of participation requirements, sources of information, group response submission procedure, and assessment criteria). This feedback was in keeping with the finding by Feenberg (1993) that students did not understand brief questions posed in a CMC environment, concluding that it took "far more nerve to admit confusion and ask for clarification in a written medium than face-to-face" (p. 194). As a result, the overall structure for the learning activity was more clearly defined.

The implication for the face-to-face learning environment was the development of activity sheets. For the Web-based learning environment, the implication was a proliferation of Web pages for each activity.

In the revised structure, each activity first involved an introduction to the task. In the face-to-face learning environment this would be associated with a verbal prologue by the subject lecturer and the distribution of an individualised worksheet which consisted of questions which served as a prelude to the group activity. For the Web-based environment, upon login to the Activity Centre and selection of the task for the week, students were presented with This Week's Task Intro page (see Figure 3.11). This introduced the student to the activity, related the activity to a specific lecture, and provided additional conceptual information. This page covered the information that the lecturer provided in the face-to-face situation. Finally, this page also
included stimulus for the group activity by asking the student to respond to some initial, topical questions (i.e., viz the individual worksheet in the face-to-face environment).

Figure 3.11: Example of revised learning activity This Week's Task Intro page.

In the face-to-face environment, once the student completed the individual worksheet, he/she moved on to explore the collaborative activity with her/his learning group. This was facilitated by a group worksheet that would clearly describe the group task. In the Web-based environment, when the student submitted her/his
response to the initial, individual questions, he/she was automatically moved to the Group Tasks page (see Figure 3.12). Similar to the group worksheet in the face-to-face environment, the Group Tasks page included a detailed description of the group task for that particular learning activity.

![Figure 3.12: Example of revised learning activity Group Tasks page.](image)
In the face-to-face environment, students were encouraged to share their responses to the individual introduction questions with the members of their learning group. In the Web-based learning environment, this was electronically facilitated through the *Individual Responses* page, which was accessible to all members of the learning group (see Figure 3.13).

![Figure 3.13: Example of revised learning activity Individual Responses page.](image-url)
Within the face-to-face environment, once they had received the description the group task, learning groups were free to manage their collaborative activity as they chose (i.e., they were not required to engage in and complete the group task within the tutorial classroom).

To facilitate the group collaboration within the Web-based learning environment, the earlier version of the Discussion Area was maintained. However, based on reviewers' suggestions, an abbreviated list of the group tasks was added to the top of the Discussion Area page (see Figure 3.14).
Activity ~Week 6
Risk Factors
Discussion Area

NOTE: It's a good idea to click on the "Reload" or "Refresh" button on the top of your browser to make sure you are seeing all the latest comments made by your group members.

AND, just a reminder of your group tasks:

1. Coroners Report (100 words) on Crabwell Grommett considering:
   - Did Crabwell Grommett die of natural causes?
   - What contributed to his death?
   - What are the risk factors of heart disease?

2. Your version (250 words) of Crabwell for HIV/AIDS risk factors

3. Group consensus on:
   - Why do people take risks when they have the knowledge to avoid them?
   - Why do people engage in potentially health compromising behaviours when they know better?

Figure 3.14: Example of revised learning activity Discussion Area.
Reviewers suggested a clarification of the format for group responses to learning activities. Consequently, for those engaged in the face-to-face learning environment, the group worksheets included sufficient space to respond to all aspects of the group tasks. Groups were verbally advised to submit their responses in a format which best suited their collaborative management process and their interpretation of the group task (such as word-processed documents, drawings, etc.). For the Web-based learning environment, a Submit Page was added to the structure of each Web-based learning activity to create a response scaffold for learning groups (see Figure 3.15).

Figure 3.15: Example of revised learning activity Submit Page.
A folder strategy was developed as a submission system for both face-to-face and Web-based learning activity group responses. During the first tutorial of the session, each group was given a file folder in which they were to put their group response and subsequently submit the folder to the subject tutor. By the end of session, groups had a collection of their work for each learning activity. The folder was used for all learning group collaborative activities (i.e., in both the face-to-face and Web-based learning environment) in order to maintain consistency. Groups engaged in the Web-based learning activities printed a copy of the responses that they entered in the Submit Page scaffold and included the print-out in their group folder.

In the Web-based learning environment, all pages of each learning activity were accessible to members of the learning group at all times (i.e., students were not forced to follow a particular page sequence when engaging in the activity). Additionally, to further clarify the activity structure, a number of pages were constructed to assure students that their submissions to the activity (e.g., responses to initial questions, comments to the Discussion Area, and completion of the Submit Page) were successful. For example, when the group leader (or designate) completed the Submit Page, a confirmation page was generated (see Figure 3.16).
HOORAY!
The Submit Page has been sent to Prof. Patterson and your group has completed the Week 13 Body Image tutorial!

Remember - turn your folder by noon Monday.

That's it for the Web!
Next tutorial we're back in room 67.303

Figure 3.16: Example of a confirmation of the group submission to the Web learning environment.
Furthermore, when any group member returned to the *Submit Page* after the learning activity was completed, they received a notice that the group task for that week was complete and a reminder of the group response (see Figure 3.17).

![Figure 3.17: Example notice of group completion of the learning activity.](image)

1. **Synthesis of the group members’ response to: “How important is your body image to you?”**

   Body image is definitely an issue for the people in our group, however they are in different capacities. Impressions in today’s society, whether it be a formal or in the swimming pool have a relative importance in our lives, it is well documented that women have more of an issue with their body which would explain why they are generally more conscious while swimming, men also need to make impressions, probably not to the same expectations but it is still an issue. In both sexes, social functions require grooming, and effort is made to enhance appearances, which also evolves around body image.
A site map for the revised Web-based learning activity is provided in Figure 3.18.

![Figure 3.18: Revised Web-based learning activity site map.]

Each collaborative learning activity was revised to conform to the new activity structure. The Web pages associated with each learning activity were enhanced to provide more conceptual information that would refer to lectures. Attention was given to ensure that an informal tone was used for the written description of the activity and related information (i.e., similar to the speaking tone a lecturer might use in a face-to-face tutorial environment). Additionally, feedback received from the expert reviewers in terms of perceived pedagogical effectiveness of the collaborative learning activities was utilised to enhance each activity.
Individual Learning Activities

The learning activities, as originally designed, are described below. Copies of the Web pages associated with each of these learning activities have been included in Appendix H. A summary of the feedback received from the expert and peer reviewers regarding individual activities is also provided. Finally, a description of the revised activity (which was subsequently returned to a subset of the health education experts for further review) is provided. Copies of the Web pages associated with each learning activity as revised for implementation can be found in Appendix I.

HIV/AIDS-related Learning Activities

The HIV/AIDS learning activities explored issues related to modes of transmission of the HIV virus, risk factors associated contracting HIV/AIDS and health behaviour change. The complexity of the learning tasks increased through the series of three activities.

HIV/AIDS - Modes of Transmission

As originally designed, in the first HIV/AIDS related learning activity each member of the learning group responded to the question, "Which of these situations can transmit HIV?" where the situations included:

- Having a blood transfusion in Australia.
- Being cried on by a person with HIV.
- hugging and kissing a person with HIV.
- Treading on a needle with HIV-infected blood in it.
- Sharing plates and cutlery with someone with HIV.
• Having penetrative sex without a condom.
• Sitting on a toilet seat after a person with HIV has sat there.
• Getting blood from a person with HIV into a wound.

Possible responses to the question for each situation were 'yes', 'no', and 'not sure'. Once each group member provided his/her individual response, he/she explained, defended, and/or argued his/her choice for each situation with his/her group members. The group then developed a consensus for each situation and an explanation for their final choice.

Reviewers felt that this learning activity was clearly described (15 of 20 reviewers who responded) and would motivate students to participate and promote discussion among learning groups (15 of 20 reviewers who responded). Some reviewers suggested that the instructions require the learning groups to justify their answers (as they had to do in their individual responses) so that group responses were not provided without explanation.

The focus of the changes to this activity was reflected in the new structure of the learning activity. The individual worksheet and the This Week's Task Intro page reiterated some of the content that would have been covered in lectures in terms of the concept of the chain of infection of communicable disease. It also included a questionnaire, which asked students to complete (on an individual basis) a form that included the possible situations in which HIV can be transmitted (as noted above). In the Web-based learning environment, responses to these questions appeared on the
Individual Responses page for their learning group. This facilitated a preface to the more detailed group task in which group members:

- explained/defended/argued their choice for each situation until a group consensus was reached for each situation;
- agreed on a list of modes of transmission of HIV/AIDS;
- explained which link of the chain of infection they would remove for HIV/AIDS and why; and
- identified commonalities among their responses to situations in which HIV can/cannot be transmitted.

The Submit Page for this activity was developed to provide a scaffold for each aspect of the task.

HIV/AIDS - Risk Factors

Learning groups were presented with a narrative entitled "Crabwell Grommet" which described the lifestyle of a 51-year-old male who received a sign of his impending death. After reading the story, learning groups were to consider the questions: did Crabwell die of natural causes; what contributed to his death; and, what are risk factors of heart disease? Learning groups then develop their own version of "Crabwell Grommett" for HIV/AIDS, which focused on risk factors. They also provided a group response to the question: Why do people take risks when they have the knowledge of modes of transmission and risk factors and should be able to avoid risk situations?

Reviewers felt that the HIV/AIDS Risk Factors learning activity was clearly described (14 of 18 reviewers who responded) and would motivate students to
participate and promote discussion among learning groups (14 of 18 reviewers who responded). Some expert reviewers noted that students might get "carried away" with the creativity of developing the new narrative yet felt that the questions associated with the narrative development would be effective in bringing the activity into perspective.

The revised risk factors learning activity incorporated the new activity structure. The individual worksheet and the This Week's Task Intro page asked students to define a risk factor. Students' understanding of the concept of risk factor was integral to their exploration of the group task which, in the revised version of the activity, maintained the "Crabwell Grommett" story. Learning groups considered the causes of Crabwell's death and developed a coroner's report (of no more than 100 words) to respond to the questions: Did Crabwell die of natural causes, what contributed to his death, and what are risk factors of heart disease? Learning groups then rewrote the story of "Crabwell Grommett" to reflect the risk factors for HIV/AIDS (in no more than 250 words). Finally, each learning group developed a consensus regarding the issue: Why do people take risks and engage in health compromising behaviours when they have the knowledge to avoid them? The Submit Page for this activity was developed to provide a scaffold for each aspect of the task.

HIV/AIDS - Learning & Logic (Behaviour change)

Originally entitled, Learning and Logic, in this activity learning groups were presented with a graphic that depicted a staircase, with a caveman at the bottom step represented someone who was unaware, uneducated and engaged in HIV/AIDS-related behaviours and a modern female student at the top step who was aware,
educated and, where appropriate, engaged in HIV/AIDS-avoidance behaviours. Learning groups discussed the questions:

- How do you move people from the bottom step to the top?
- What are the steps along the way?
- What educational programs can you put in place?
- What might they contain?
- Are you aware of any educational programs that are known to be effective?

Learning groups considered these questions in light of the fact that, despite all the smoking prevention programs in existence, teenagers are taking up smoking at an increasing rate.

Reviewers felt that the HIV/AIDS Learning & Logic learning activity was clearly described (15 of 20 reviewers who responded) and would motivate students to participate and promote discussion among learning groups (16 of 20 reviewers who responded). Expert reviewers felt the activity included challenging questions, which would promote discussion among the learning group. Some reviewers felt that both the title of the activity and the reference to anti-smoking education programs may cause confusion for students. A number of reviewers made comments regarding the corresponding graphic for the activity in terms of potential interpretations of male/female stereotyping and the steps of behaviour change in hierarchical levels (i.e. rather than a continuum).

This activity was renamed, Behaviour and Behaviour Change, to more accurately reflect the topic covered. The individual worksheet and the *This Week's Task Intro*
page presented the students with a number of terms that had been previously covered in the lectures and tutorial learning activities including health, health field concept, homeostasis, disease, risk factor, epidemiology, John Snow, communicable disease and chain of infection. Students were asked to denote their level of understanding for each term as an introductory task. The learning group then discussed one of the listed terms of their choice. Learning groups also developed a consensus regarding the questions: Why do you need to know this; what does this add to your role as a Personal Development, Health, and Physical Education (PDHPE) professional and what is your role or your mission as a PDHPE professional? Groups were provided with an animated graphic, which depicted a human moving along a continuum from the status of unaware, uneducated and engaged in HIV/AIDS-related behaviours toward aware, educated and, engaged in HIV/AIDS-avoidance behaviours. This was used to frame their development of a group consensus regarding the questions: How do you get people to change their behaviour and what stages do people go through in making a behaviour change? Finally, groups considered school health education programs and developed a group response to the questions: How do they work and what is their theoretical basis? The Submit Page for this activity was constructed to provide a scaffold for each aspect of the group task.

*Nutrition-related Learning Activities*

The original version of the three nutrition-related learning activities followed a theme approach. The theme represented through the activities was, "Food is an unnecessary addiction and leads to eating disorders." Reviewers felt that the theme approach was inconsistent with the other activities (which did not follow a theme).
They also felt that variation in interpretation of the theme might cause unnecessary confusion for students. Generally, reviewers were of the opinion that the nutrition-related learning activities were not as pedagogically strong as the HIV/AIDS-related activities.

Nutrition - Food Facts

In the original Food Facts activity, learning groups were presented with the theme and asked to focus on the theme and consider the questions:

- Why do we need food (think about the nutrients in food, i.e., proteins, carbohydrates, fibre, fats, vitamins, minerals)?
- What is necessary (think about food groups and recommended daily intake)?

Learning groups were presented with a set of "Dear Dolly" questions (i.e., ask-the-expert format questions regarding nutrition written to a fictitious advice columnist). Learning groups were asked to provide a group response for each question.

Reviewers felt that the Food Facts learning activity was clearly described (12 of 17 reviewers who responded) and would motivate student to participate and promote discussion among learning groups (11 of 17 reviewers who responded). Reviewers tended to feel that this activity was not challenging enough to motivate students. Some reviewers felt the "Dear Dolly" questions were too unrealistic to be taken seriously by learning groups. Some reviewers felt that the theme presented caused confusion and detracted from the task.
The activity was significantly changed from the original version by removal of the "Dear Dolly" question strategy. The introduction to the new activity (i.e., This Week's Task Intro page) asked students to explain the similarities and differences between the PRECEDE and Health Belief models of behaviour change. Students were also asked to provide a list of the major food groups, explain the food pyramid, explain why the pyramid could be represented upside down, and develop two questions related to each of the essential nutrients. The learning group then decided on a group list of the five major food groups and came up with a consensus regarding the food pyramid and why educators might represent it upside down. Finally, learning groups chose the two most important questions that had been developed for each essential nutrient by the group members and came up with a group response to each question for each nutrient. The Submit Page for this activity provided a scaffold for each aspect of the group task.

Nutrition - Food Choices

In the original design of the Food Choices activity, students were presented with true/false statements to which each member was to respond. The statements were:

- People eat when they are not hungry.
- People eat according to taste, texture and presentation and not for nutritional value.
- People's diets are determined by culture.
- People's diets are influenced by their lifestyle.

Learning groups then used the responses of each member to the true/false statements and collaborated to define addiction as it may possibly relate to food and give
examples of their own addicted behaviour in regard to food. Learning groups then considered a case study of a 19-year-old university student, "Chris", who engaged in a traditional Australian diet. Groups developed a group response to the question, "how would you get Chris to change dietary patterns?"

Reviewers felt that the Food Choices learning activity was clearly described (12 of 19 reviewers who responded) and would motivate students to participate and promote discussion among learning groups (11 of 19 reviewers who responded). Many expert reviewers questioned the concept of the traditional Australian diet and suggested providing a more complete description of the eating patterns for the case study presented. Expert reviewers also suggested changing the choices of the introductory questions from true/false to agree/disagree with opportunity for elaboration or justification with the response.

The revised *Week's Task Intro* for the Food Choices learning activity included an online pop quiz with true/false statements including:

- An average adult digests 500kg of food per year.
- Raspberries have the highest level of dietary fibre.
- One kiwi fruit has twice the RDI for vitamin C.

The learning group was presented with a case study of the sedentary lifestyle patterns of a 22-year-old male named "Ron." Ron's employer hired the group to present a work-site health promotion program. In this context, groups developed a consensus on the predisposing factors associated with Ron's problem with particular attention to the knowledge Ron should have regarding nutrition. Each group then
developed a consensus regarding the enabling factors associated with weight management and a program that might address those factors. Finally, each group listed three creative ways to alter Ron's external environment to improve nutritional behaviour. The Submit Page scaffold was constructed to facilitate response to each aspect of the group task.

Nutrition - Body Shape and Body Image

As originally designed, students were first asked to respond to the questions:

- How tall are you?
- How much do you weigh?
- Do you consider yourself: overweight; underweight; or, just right?
- Choose the statement you most identify with: I am happy with my body shape; No, I'm not happy with my body shape; or, My body shape could be better.
- My main nutritional disorder is that: I eat too much; I eat too little; I don't eat the right balance of food; or, I'm just fine.

Learning groups then used these initial questions to focus their discussion on the following questions:

- Is there a relationship between real body shape perceived body image and diet?
- How important is your body image to you? How does this compare with the rest of your group?
- Is body image overemphasised in society?
- Are physical education students too preoccupied with body image? How might the concept of body image affect their role as health educators?
Reviewers felt that the Body Image learning activity was clearly described (11 of 17 reviewers who responded) and would motivate students to participate and promote discussion among learning groups (9 of 17 reviewers who responded). Some expert reviewers asked whether questions requiring self-disclosure would promote or inhibit interaction within the learning groups. Expert reviewers reacted positively to putting students in their future roles as teachers.

The Week's Task Intro for the Body Image learning activity asked students to respond to three statements:

- Do you consider yourself: overweight; underweight; or, just right?
- Choose the statement you most identify with: I am happy with my body shape; No, I'm not happy with my body shape; or, My body shape could be better.
- My main nutritional disorder is that: I eat too much; I eat too little; I don't eat the right balance of food; or, I'm just fine.

Each learning group then developed a synthesis of the group members' responses to the question: How important is your body image to you? Groups developed a consensus, with supporting evidence, which defended or refuted the statement: Body image is overemphasised in society. Finally, they developed a group response to the suggestion that physical and health educators were biased in dealing with issues related to body image because they were preoccupied with strong, athletic body images.
Summary

The design and development of the learning activities and subject Web site was based on theoretical frameworks that underpin health education (e.g., health belief model; theory of reasoned action; social cognitive theory; theory of planned behaviour and the transtheoretical model as referred to in Chapter 2). Reported research and applications within the fields of educational technology and health education also informed this process. The formative evaluation process proved invaluable in providing a measure of the potential pedagogical effectiveness of the learning activities and the subject Web site. The outcomes of this phase included enhancement of learning activities and the learning environment which were then implemented within phase two of the research study.
Phase 2 of this research consisted of an investigation of the implementation of the redesigned and evaluated tutorial learning activities and the Web-based learning environment within the undergraduate health subject, EDUP144: Health and Health Behaviour. This chapter describes the research methodology utilised to implement this phase of the investigation and the data collection and analysis techniques utilised to address the research questions.

Research Design

As previously addressed, health education has developed from an eclectic scientific base and includes a dynamic knowledge base, the exploration of attitudes, beliefs and values, and health-related behaviours. Thus, the characteristics of health education, and the nature of the research questions specific to this study, necessitated an exploration of both qualitative and quantitative methods of enquiry. While there has been much debate in the literature regarding the combination of qualitative and quantitative methods and designs within one study, Reeves (1991) argued for the use of a range of methodologies, both quantitative and qualitative, in research and evaluation of interactive, multimedia technologies in higher education. Reeves (1991) explained that as "no one methodology can provide unequivocal support for a theory, evaluators should attempt to support their hypotheses from a number of perspectives" (p. 108).

Some have argued against combining qualitative and quantitative approaches because they view the philosophical and theoretical foundations of the two as contradictory
and mutually exclusive (Oiler Boyd, 1990). However, a review of the literature identified a number of purposes and strengths for combining qualitative and quantitative approaches within a single study. Such purposes put forward in the literature included triangulation or convergence of findings, elaboration on results, utilisation of one method to inform another, identification of paradox or contradiction, and extension of the scope and breadth of the inquiry (Creswell, 1994; Green, Caracelli, & Graham, 1989).

A mixed-methodology design was utilised for this investigation. In such a design, aspects of the qualitative and quantitative paradigms are mixed at all or many methodological steps (Creswell, 1994). This was the case in this research investigation. While the source of data remained constant (i.e., students enrolled in the subject), the theoretical perspectives and the methods of data collection and analysis provided triangulation.

This phase of the study focused on the tutorial segment of the subject (i.e., EDUP144: Health and Health Behaviour) in which the collaborative learning activities were implemented. The subject session consisted of a 14-week schedule. Each week was associated with:

- A two-hour mass lecture held each Tuesday morning of the semester from 8:30 a.m. to 10:30 a.m. and attended by all participants.
- A collaborative tutorial activity initiated in one of two tutorial time slots on Tuesday afternoons (1:35 p.m. to 2:30 p.m. or 2:35 p.m. to 3:30 p.m.).
During the first half of the subject session, three collaborative tutorial activities related to the topic of HIV/AIDS were used as the focus of investigation. The procedure and data associated with the participants' engagement in these tutorials was termed experiment 1 (E1). During the second half of the subject session, three collaborative tutorial activities related to the topic of nutrition were used as the focus of investigation. The procedure and data associated with the participants' engagement in these tutorials was termed experiment 2 (E2).

Participants (n=62) were randomly assigned into one of two tutorial classes (i.e., TC1 and TC2). Each group was then randomly assigned to one of the two learning environments (Web or face-to-face) for the three tutorials in the first half of the subject session that were related to HIV/AIDS (i.e., experiment 1). For the second half of the subject session (i.e., experiment 2) tutorial classes crossed over to engage in the alternate learning environment. That is, tutorial class one (TC1) engaged in the Web environment for experiment 1 and then engaged in the face-to-face environment for experiment 2, while tutorial class two (TC2) engaged in the face-to-face environment for experiment 1 and then engaged in the Web environment for experiment 2. Figure 4.1 illustrates this design.
Figure 4.1: Phase 2, research design.

Tutorials classes were further divided into learning groups. In their review of the literature regarding optimal group size, Valacich, Dennis and Nunamaker (1992) found small groups of between three and five members most effective for idea generation - particularly when those groups were not supported technologically. Given that learning groups for the subject would experience both a face-to-face and Web-based environment, it was decided that each group would consist of four or five members. Thus, both tutorial classes one and two consisted of four learning groups with four members and three learning groups with five members.

The methodological features of the design included randomly assigned comparison groups, control for instructor effect (i.e., same lecturer facilitated both groups),
control for historical effect (i.e., data collected within same semester), and scoring bias controlled by objective testing (Lewis, Harper, & Wilson, 1991).

Research Methods

Study Participants

The participants in the study were students enrolled in a first year, undergraduate, health subject entitled, EDUP144: Health and Health Behaviour, in the Faculty of Education at the University of Wollongong during the second session of the 1998 academic year (i.e., 20 July 1998 to 24 November 1998). Sixty-two students were enrolled in the subject. These students were asked to participate in the study on a voluntary basis, thus satisfying the Human Research Ethics Policy of the University of Wollongong. All students agreed to participate (n=62).

Data Collection Instruments

As mentioned above, the investigation made use of a variety of both quantitative and qualitative data collection techniques. Demographic information was collected from participants using a General Information Questionnaire. Measurement of learning outcomes related to HIV/AIDS and nutrition related knowledge, attitudes and behaviours involved commonly used techniques for assessing these domains.

General Information Questionnaire (GIQ)

An instrument entitled General Information Questionnaire (GIQ) was developed specifically for this study and used to collect basic information to profile the
participants. Questions related to gender, age, previous completion of senior secondary level personal development, health and physical education study, previous experience using computers, and previous experience using the Web. The instrument was scored using normal data techniques. A copy of this questionnaire can be found in Appendix J.

**Computer Attitude Questionnaire (CAQ)**

To measure changes in learners' attitude toward using computers, a Computer Attitude Questionnaire was utilised (see Appendix K). This 24 item scale was derived by Francis (1993) from a number of instruments designed to measure attitude toward computers. Each item was arranged on a five point Likert scale with responses including 'strongly agree', 'agree', 'not certain', 'disagree', and 'strongly disagree.' The response to each item was given a score between one and five and the score for each item added to derive a total score for the scale. The range of possible total scores for the scale was 24 to 120. Francis (1993) tested the reliability of this scale on a group of undergraduate students that produced item rest of scale correlation coefficients between 0.59 and 0.82 with factor loadings between 0.62 and 0.85. The alpha coefficient for the scale was 0.96.

**HIV/AIDS-related Questionnaire (HRQ)**

Questions in the HIV/AIDS-related Questionnaire (HRQ) were developed through consideration of the content within the domain of the subject (e.g., modes of transmission, risk factors and health behaviour related to HIV/AIDS) and selection of questions from established instruments developed for the purposes of examining the

Scoring

Possible responses to the HIV/AIDS-related knowledge statements were 'true', 'false' and 'not sure.' The correct response to each item on the knowledge sub-scale was given a score of one. Both incorrect and 'not sure' responses were given a score of nought. A total score was derived for the knowledge sub-scale and the range of possible total scores was 0 to 17. Thus, the higher the score the higher HIV/AIDS-related knowledge.

Each item on the attitude sub-scale was arranged on a Likert scale including 'strongly agree', 'agree', 'disagree', 'strongly disagree.' The response to each item was given a score between one and four and the score for all items added to derive a total score for the scale. The range of possible total scores for the scale was 6 to 24. The higher the total score the more positive attitude to issues related to HIV/AIDS.

Each item on the behaviour sub-scale was arranged on a Likert scale including 'always', 'almost always', 'sometimes', 'hardly ever', 'never', 'not applicable.' The response to each item was given a score between 1 and 6 and the score for each item added to derive a total score for the scale. The range of possible total scores for the scale was 5 to 30. The higher the total score the more likely that the individual participated in HIV/AIDS prevention or avoidance behaviour.
Validity and Reliability

The instrument was pilot-tested and adjustments made accordingly. The resulting questionnaire was provided to a panel of experts (see Appendix L) in the area of health education, who were satisfied that criteria for construct and face validity were met. The instrument was trialed with an undergraduate population to establish test retest reliability (.713) and internal reliability using Cronbach's Alpha. The resulting alpha for the knowledge scale was .758, for the attitude scale was .724 and for the behaviour scale was .721. The final version HRQ (see Appendix M) which was used in experiment 1 included 17 items related to knowledge, six items related to attitude, and five items related to behaviour. Table 4.1 summarises the HIV/AIDS-related Questionnaire.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Number of items in scale</th>
<th>Type of item in scale</th>
<th>Response categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>17</td>
<td>Factual statements about HIV/AIDS as it relates to Australia.</td>
<td>True</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>False</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not Sure</td>
</tr>
<tr>
<td>Attitude</td>
<td>6</td>
<td>Statements related to attitudinal issues about HIV and AIDS.</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Agree</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Disagree</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>Behaviour</td>
<td>5</td>
<td>Statements related to behavioural practices in situations where HIV and AIDS might be a factor.</td>
<td>Always</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Almost Always</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hardly Ever</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Never</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not Applicable</td>
</tr>
</tbody>
</table>

Note: Validity
- construct and face validity via expert panel

Reliability
- test re-test reliability
- internal reliability

Table 4.1: Summary of HIV/AIDS-related Questionnaire.
**Nutrition-related Questionnaire (NRQ)**

The Nutrition-related Questionnaire (NRQ) was derived through consideration of the content within the domain of the subject (e.g., essential nutrients, health eating, eating behaviours, body image, weight management, and eating disorders) and selection of items from established instruments developed for the purposes of measuring nutrition related knowledge, attitudes and behaviours (IOX Assessment Associates, 1988).

**Scoring**

Possible responses to the nutrition-related knowledge statements were 'true', 'false' and 'not sure.' The correct response to each item on the knowledge sub-scale was given a score of one. Both incorrect and 'not sure' responses were given a score of nought. A total score was derived for the knowledge sub-scale and the range of possible total scores was 0 to 16. Thus, the higher the score the higher nutrition-related knowledge.

Each item on the attitude sub-scale was arranged on a Likert scale including 'strongly agree', 'agree', 'disagree', 'strongly disagree.' The response to each item was given a score between one and four and the score for all items added to derive a total score for the scale. The range of possible total scores for the scale was 7 to 28. The higher the total score the more positive attitude to issues related to nutrition.

Each item on the behaviour sub-scale was arranged on a Likert scale including 'always', 'almost always', 'sometimes', 'hardly ever', 'never.' The response to each item was given a score between 1 and 6 and the scores for all items added to derive a
total score for the scale. The range of possible total scores for the scale was 5 to 30. The higher the total score the more likely that the individual participated in healthy nutrition-related behaviour.

Validity and Reliability

The instrument was pilot tested and adjustments made accordingly. The resulting questionnaire was provided to a panel of experts (see Appendix L) in the area of health education, who were satisfied that criteria for construct and face validity were met. The instrument was trialed with an undergraduate population to establish test retest reliability (.676) and internal reliability using Cronbach’s Alpha. The resulting alpha for the knowledge scale was .68, for the attitude scale was .673 and for the behaviour scale was .818.

The final version NRQ (see Appendix N) which was used in experiment 2 included 16 knowledge items, 7 attitude items and 5 behaviour items. Table 4.2 summarises the Nutrition-related Questionnaire.
Table 4.2: Summary of Nutrition-related Questionnaire.

<table>
<thead>
<tr>
<th>Domain</th>
<th>Number of items in scale</th>
<th>Type of item in scale</th>
<th>Response categories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>16</td>
<td>Factual statements about nutrition.</td>
<td>True</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>False</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Not Sure</td>
</tr>
<tr>
<td>Attitude</td>
<td>7</td>
<td>Statements related to attitudinal issues about nutrition.</td>
<td>Strongly Agree</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Agree</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Disagree</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Strongly Disagree</td>
</tr>
<tr>
<td>Behaviour</td>
<td>5</td>
<td>Statements related to nutritional practices.</td>
<td>Always</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Almost Always</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Sometimes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Hardly Ever</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Never</td>
</tr>
</tbody>
</table>

Note: Validity • construct and face validity via expert panel
      Reliability • test re-test reliability
      • internal reliability

Web Use Questionnaire (WUQ)

The purpose of the Web Use Questionnaire was to gather some general information from all participants regarding when and how they accessed the subject Web site and their perceptions of using the Web-based learning environments for EDUP144: Health and Health Behaviour tutorials. The instrument was scored using normal data techniques. The Web Use Questionnaire can be found in Appendix O.

Learning Group Interactions

Interactions among members of each group engaged in the Web learning environment were electronically logged by the FileMaker Pro™ database engine which supported the Web site Activity Centre (see Chapter Three). Learning groups engaged in the face-to-face environment were provided with audio tape recorders and blank audio
tapes and asked to record their group interactions, label the tape with their group name and the session week, and return the tape recording equipment when they submitted their response to the tutorial activity. Audio tapes were transcribed verbatim.

**In-depth Interviews**

Upon completion of each experiment (i.e., E1 and E2), a representative of each learning group was chosen, at random, and asked to participate in an in-depth interview regarding the learning experience. All randomly selected students agreed to participate in an interview (i.e., Experiment 1, n=7, Experiment 2, n=7). Table 4.3 provides a summary of the randomly selected in-depth interview participants by gender.

<table>
<thead>
<tr>
<th></th>
<th>Female</th>
<th>Male</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>E1</td>
<td>4</td>
<td>3</td>
<td>7</td>
</tr>
<tr>
<td>E2</td>
<td>3</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>7</td>
<td>7</td>
<td>14</td>
</tr>
</tbody>
</table>

Each interview followed a semi-structured interview guide (see Appendix P) which explored issues related to the research questions but allowed enough flexibility for interviewees to express a range of individual perceptions regarding their learning experiences (Minichiello et al, 1995). Specifically, the interview guide raised issues with interviewees pertaining to:

- group management processes and issues in both learning environments;
• nature of group members contributions in both learning environments;
• effectiveness of each environment in terms of facilitating learning;
• advantages and disadvantages of both learning environments;
• suggested improvements for collaborative activities and/or subject Web site; and
• impact of use of Web site for learning activities on computer skills and comfort using computers.

At the beginning of each interview, interviewees were asked if they had any objection to the audio tape recording of the interviews and were advised that their comments would be recorded anonymously, that they would not be identified individually, and their participation would have no impact on their involvement or assessment in the subject. All interviewees agreed to the tape recording process, thus all interviews were audio tape recorded to ensure a full and accurate record was obtained (Minichiello et al, 1995). During the course of each interview, the interview guide was followed with probing questions asked at instances where further detail or clarification was required.

At the conclusion of each interview, the audio tape was labelled with the individual identification code of the interviewee and the group name which the interviewee represented. Within one week of the interview, the audio tape was transcribed verbatim and the interviewee identification number and group name included on the transcript. In cases where interviewees referred to another student by name, the student's name was changed in the interview transcript. This timeframe for transcription ensured that the researcher could re-contact the interviewee for
clarification if any portion of the audio tape quality was inadequate. It was unnecessary to re-contact any interviewees.

Table 4.4 summarises the relationship of each data collection technique to the research questions.

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>How effective is the use of a Web-based learning environment in delivering health education relative to that of the traditional face-to-face environment in terms of knowledge, attitude and behaviour change?</td>
<td>HRQ Knowledge Scale (Qs 1-17) pre and post HRQ Attitude Scale (Qs 18-23) pre and post HRQ Behaviour Scale (Qs 24-28) pre and post</td>
</tr>
<tr>
<td>How do learners participate in and contribute to collaborative health education learning activities within Web-based and face-to-face learning environments?</td>
<td>Audio Tapes of group class discussions Electronic logs of group Web discussions In-depth Interviews (explanatory)</td>
</tr>
<tr>
<td>What are learners' perceptions of the effectiveness of Web-based learning environments for health education?</td>
<td>In-depth Interviews Web Use Questionnaire (WUQ)</td>
</tr>
<tr>
<td>What impact does using a Web-based learning environment for health education have on learners' attitude toward using computers?</td>
<td>Computer Attitude Questionnaire (CAQ) pre and post In-depth Interviews</td>
</tr>
</tbody>
</table>
Procedure

The Human Research Ethics Committee of the University of Wollongong granted permission to undertake the experiments associated with phase 2 of this investigation. The letter of permission can be found in Appendix Q.

A subject enrolment list was obtained from the University of Wollongong administrative offices. Based on this list, students were randomly assigned to one of two tutorial classes (i.e., TC1 and TC2).

In lecture during the first week of the semester, students were advised of the research study and provided with written documentation entitled "Health and Health Behaviour EDUP144 Research Information Page" (see Appendix R). This documentation clearly outlined what was involved in the research and what students would be asked to do as participants. Students clearly understood that participation in the research study was purely voluntary, that they could withdraw at any time, and that participation or non-participation in the study would have no effect on their participation or assessment in the subject. A "Consent to Participate" form (see Appendix S) was also distributed and students were asked to sign this form if they chose to participate in the study. All students enrolled in the subject volunteered to participate in the study. When students agreed to participate in the study, they were asked to complete the General Information Questionnaire (GIQ) and Computer Attitude Questionnaire (CAQ). An identification number was used in the collection of data for each participant.
During this first lecture, students were also provided with the subject outline, which documented background information about the subject (see Appendix A) and advised of the subject Web site and its address. At that point, all students could access the subject information and resources but could not access the Activity Centre where Web-based tutorials were located. Students were also notified of their tutorial class assignment (i.e., TC1 or TC2) and the time and location of the assigned tutorial.

During the first tutorial meeting, a number of 'ice-breaking' activities were conducted in order to randomly assign students into smaller learning groups of four or five (i.e., seven learning groups in each tutorial class). Groups were asked to create a group name for identification purposes. The lecturer explained to students that:

- The tutorial format consisted of collaborative learning activities.
- Students would be presented with the weekly activity at the beginning of each tutorial.
- Students were to work with their group to develop a response to the activity,
- Learning groups were to submit their response to the tutor by noon on the following Monday (i.e., within a one week period).
- Learning group responses were to be submitted in their group folder (which was provided during the first tutorial).

The HIV/AIDS-related Questionnaire (HRQ) pre-test was administered to all participants during the week three lecture. At this time, students in Tutorial Class One (TC1) were provided with a brief presentation, with supporting documentation (see Appendix T) as an introduction to the Web site and the structure of the collaborative learning activities that they would find within the Activity Centre of the
Web site. At this time, they were also given an individual username and password to access the Activity Centre.

The intervention for experiment 1 was initiated during week four of the session. This time frame allowed students to develop a working relationship within their learning group; become accustomed to the process of completing and submitting their group work within the weekly time frame; and, for those concurrently enrolled in an Information Technology subject (n=57), complete three weeks of Web-related skill development exercises.

For those engaged in the Web-based tutorials, hyperlinks to access the learning activity were activated by 12:00pm on Tuesdays. These links were de-activated at 12:00pm on the following Monday (i.e., the time when groups were to submit their response). Responses to questions, comments provided in the Discussion Area and completion of the Submit Page were automatically recorded by the FileMaker Pro™ databases which supported the Web-based learning activities. These databases were backed up at 9:00am and 5:00pm on weekdays and two to four times on weekends. An additional backup was performed at 12:00pm Mondays as the tutorial activity link was de-activated. Students engaged in the face-to-face learning activities were provided with an audio tape recorder, a blank audio tape and asked to write their group name on the tape and submit the tape with their learning activity sheets and responses with their group folder.

The HIV/AIDS related learning activities associated with experiment 1 were scheduled for implementation during weeks four, five and six of the session.
However, during the fifth week of the session, the city of Wollongong experienced a flood and was proclaimed a natural disaster area for a period of one week. An announcement that University classes were cancelled was made two hours prior to the scheduled start of the EDUP144: Health and Health Behaviour lecture. Thus, the session schedule was altered by being moved back by one week. Therefore, the HIV/AIDS related learning activities associated with experiment 1 were conducted in weeks four, six and seven of session.

The HIV/AIDS-related Questionnaire (HRQ) post-test was administered to all participants during the week eight lecture. During this week, a representative from each learning group that had engaged in the Web-based learning environment for the experiment 1 learning activities was randomly chosen and asked to engage in an in-depth interview. Interviews were conducted at a time convenient to the interviewee during week eight of the session.

The pre-test Nutrition-related Questionnaire (NRQ) was administered to all participants during the week ten lecture. At this time, students in tutorial class two (TC2) were provided with a brief presentation regarding the Web tutorials. Supporting documentation similar to that received by tutorial class one during experiment 1, with a minor alteration to denote the usual meeting time of that particular tutorial group, was supplied. This served as an introduction to the Web site and the structure of the collaborative learning activities that they would find within the Activity Centre of the Web site. At this time, they were also given an individual username and password to access the Activity Centre.
The nutrition-related learning activities associated with experiment 2 were implemented during weeks 11, 12 and 13 of the session. The same procedures related to recording of learner interactions within the face-to-face and Web-based learning environments applied. The post-test Nutrition-related Questionnaire (NRQ) was administered to all participants during the week 14 lecture. At the same time, the Computer Attitude Questionnaire post-test and Web Use Questionnaire were administered to all participants. Additionally, a representative from each learning group that had engaged in the Web-based learning environment for the experiment 2 learning activities was randomly chosen and asked to engage in an in-depth interview. Interviews were conducted at a time convenient to the interviewee during this last week of session.

The data collection procedure associated with phase 2 is illustrated in Figure 4.2 and summarised in Table 4.5.
Figure 4.2: Phase 2 - data collection procedures.
<table>
<thead>
<tr>
<th>Subject Week</th>
<th>Procedure Events</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>§ Randomisation of students into Tutorial Classes (TC1 and TC2)</td>
</tr>
<tr>
<td>Week 1 ~ 21 July</td>
<td>§ Research study information and consent to participate forms distributed/collection.</td>
</tr>
<tr>
<td></td>
<td>§ Administration of GIQ and CAQ-pre.</td>
</tr>
<tr>
<td></td>
<td>§ Randomisation of Tutorial Class into groups.</td>
</tr>
<tr>
<td>Week 2 ~ 28 July</td>
<td>§ Administration of HRQ-pre.</td>
</tr>
<tr>
<td>Week 3 ~ 4 Aug</td>
<td>§ Web site introduction and distribution of usernames and passwords for TC1.</td>
</tr>
<tr>
<td>Week 4 ~ 11 Aug</td>
<td>§ Experiment 1 ~ HIV/AIDS collaborative tutorial activities (Web and class): week one.</td>
</tr>
<tr>
<td></td>
<td>§ Group interactions recorded (electronic logs and audio tapes).</td>
</tr>
<tr>
<td>Week 5 ~ 18 Aug</td>
<td>§ Lectures and tutorials cancelled due to University closure.</td>
</tr>
<tr>
<td>Week 6 ~ 25 Aug</td>
<td>§ Experiment 1 ~ HIV/AIDS collaborative tutorial activities (Web and class): week two.</td>
</tr>
<tr>
<td></td>
<td>§ Group interactions recorded (electronic logs and audio tapes).</td>
</tr>
<tr>
<td>Week 7 ~ 1 Sept</td>
<td>§ Experiment 1 ~ HIV/AIDS collaborative tutorial activities (Web and class): week three.</td>
</tr>
<tr>
<td></td>
<td>§ Group interactions recorded (electronic logs and audio tapes).</td>
</tr>
<tr>
<td>Week 8 ~ 8 Sept</td>
<td>§ Administration of HRQ-post.</td>
</tr>
<tr>
<td></td>
<td>§ In-depth interviews with representative of each group engaged in Web-based tutorials for Experiment 1 (n=7).</td>
</tr>
<tr>
<td>Week 9 ~ 15 Sept</td>
<td>§ Administration of NRQ-pre.</td>
</tr>
<tr>
<td>Week 10 ~ 22 Sept</td>
<td>§ Web site introduction and distribution of usernames and passwords for TC2.</td>
</tr>
<tr>
<td></td>
<td>§ Recess - 28 September through 9 October</td>
</tr>
<tr>
<td>Week 11 ~ 13 Oct</td>
<td>§ Experiment 2 ~ Nutrition collaborative tutorial activities (Web and class): week one.</td>
</tr>
<tr>
<td></td>
<td>§ Group interactions recorded (electronic logs and audio tapes).</td>
</tr>
<tr>
<td>Week 12 ~ 20 Oct</td>
<td>§ Experiment 2 ~ Nutrition collaborative tutorial activities (Web and class): week two.</td>
</tr>
<tr>
<td></td>
<td>§ Group interactions recorded (electronic logs and audio tapes).</td>
</tr>
<tr>
<td>Week 13 ~ 27 Oct</td>
<td>§ Experiment 2 ~ Nutrition collaborative tutorial activities (Web and class): week three.</td>
</tr>
<tr>
<td></td>
<td>§ Group interactions recorded (electronic logs and audio tapes).</td>
</tr>
<tr>
<td>Week 14 ~ 3 Nov</td>
<td>§ Administration of NRQ-post, WUQ, and CAQ-post.</td>
</tr>
<tr>
<td></td>
<td>§ In-depth interviews with representative of each group engaged in Web-based tutorials for Experiment 2 (n=7).</td>
</tr>
</tbody>
</table>
Methods of Analysis

Quantitative Data

Data associated with the quantitative instruments were coded to enable computerised entry. Data were entered in a spreadsheet file and subsequently transferred for storage and analysis in Statistical Package for the Social Sciences (SPSS).

General Information and Web Use Questionnaires

Descriptive statistics were calculated for data associated with the General Information and Web Use Questionnaire which provided a profile of participants and their patterns and perceptions of using the subject Web site and Web-based tutorials through calculation of descriptive statistics. A code list was developed for responses to open-ended questions and descriptive statistics were performed on the coded items.

Knowledge, Attitude and Behaviour Change Data (HRQ and NRQ)

The following computations were performed on the data associated with knowledge, attitudes and behaviours related to HIV/AIDS (i.e., HRQ) and nutrition (NRQ):

- Descriptive statistics were calculated for each item.
- A score for each domain pre and post intervention was calculated and the mean and standard deviations computed.
- Gain scores for the knowledge scale (pre-test score from post-test score) were calculated.
- An Analysis of Co-variance (ANCOVA) was performed to assess changes, pre and post, in each domain (i.e, knowledge, attitude and behaviour) with the pre-
test score as the covariate. Although a Multivariate Analysis of Co-Variance (MANCOVA) was considered, the focus of the study was on the effect of the Web-based learning environment on each domain rather than the effect of the Web-based learning environment on the vector created by interactions among these domains. As such, the ANCOVA was the selected method of analysis.

- A two-tailed paired t-test was performed to determine whether a significant difference was found between pre and post scores for each domain.

**Computer Attitude Questionnaire (CAQ)**

The following computations were performed on the data associated with the Computer Attitude Questionnaire:

- Descriptive statistics were calculated for each item.
- A score pre and post intervention was calculated and the mean and standard deviations computed.
- Gain scores for the knowledge scale (pre-test score from post-test score) were calculated.
- An Analysis of Co-variance (ANCOVA) to test for the difference between treatments (i.e, learning environments) was performed with the pre-test score as the covariate.
- A two-tailed paired t-test was performed to determine whether a significant difference was found between pre and post scores.
Qualitative Data

Learning Group Interactions

A number of frameworks for the analysis of collaborative learning interactions have been proposed in the literature. The purpose of this aspect of data analysis was to inform the research question,

How do learners participate in and contribute to collaborative health education learning activities within Web-based and face-to-face learning environments?

In analysing the on-line and face-to-face discussions of the learning groups, the focus was on the nature of the interactions and not an attempt to draw inferences regarding the quality of the discussions. A framework for analysis of collaborative learning was adapted from Jara & Mellar (1999). The original framework which focused on the content of collaborative activity was as follows:

<table>
<thead>
<tr>
<th>Task</th>
<th>Detail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Referring to the problem or procedure of the task:</td>
<td></td>
</tr>
<tr>
<td>• proposing: initiations or propositions of new topics of discussion or interpretation;</td>
<td></td>
</tr>
<tr>
<td>• elaborating: elaborations, development or counter suggestions of a topic, idea or interpretation presented earlier;</td>
<td></td>
</tr>
<tr>
<td>• clarifying: justifications, clarifications, or additions of information of a proposal made earlier;</td>
<td></td>
</tr>
<tr>
<td>• requesting/challenging: requests for clarification, information, elaboration or justification of a topic, idea or interpretation made by another contributor;</td>
<td></td>
</tr>
<tr>
<td>• rejecting: expressions of disagreement with a statement made previously;</td>
<td></td>
</tr>
<tr>
<td>• narrating/summarising: summaries or narrations of the discussion made by one or more contributors.</td>
<td></td>
</tr>
<tr>
<td>Referring to outcome or task goal: where the content refers to the outcome or goal that as group or individuals has to be accomplished as product of the task.</td>
<td></td>
</tr>
<tr>
<td>Referring to external source: where the content refers to a source not contained in the conference itself.</td>
<td></td>
</tr>
</tbody>
</table>

Group

• Organisational: referring to procedures and methods of working as a group.
• Rechannel: focusing or re-focusing on a neglected area of discussion.
• Socio-affective: referring to the social dynamics of the group (usually supportive).
• Deblitative: overtly critical or over-harsh reactions ('flaming').
• Metacomment: comment on the outcome of group procedures or on group factors.

Off-task
The framework was modified to clearly delineate the sources referred during collaborative discussions. Given the content area under consideration (i.e., knowledge, attitude and behaviour related to aspects of health), divisions of personal experience, subject material, and external sources were defined within the original referring to external source category. Furthermore, it was evident that the elaboration and clarification in reference to the problem could not be accurately defined. These issues were identified by both the researcher and an independent coder who was engaged in the analysis process to ensure intra-coder reliability. The modified coding framework appears below.

<table>
<thead>
<tr>
<th>Task</th>
</tr>
</thead>
<tbody>
<tr>
<td>Referring to the problem or procedure of the task:</td>
</tr>
<tr>
<td>• <strong>proposing</strong>: initiations or propositions of new topics of discussion or interpretation;</td>
</tr>
<tr>
<td>• <strong>elaborating and clarifying</strong>: elaborations and clarification, development or counter suggestions of a topic, idea or interpretation presented earlier;</td>
</tr>
<tr>
<td>• <strong>requesting/challenging</strong>: requests for clarification, information, elaboration or justification of a topic, idea or interpretation made by another contributor;</td>
</tr>
<tr>
<td>• <strong>rejecting</strong>: expressions of disagreement with a statement made previously;</td>
</tr>
<tr>
<td>• <strong>narrating/summarising</strong>: summaries or narrations of the discussion made by one or more contributors.</td>
</tr>
<tr>
<td>Referring to outcome or task goal: where the content refers to the outcome or goal that as group or individuals has to be accomplished as product of the task.</td>
</tr>
<tr>
<td>Referring to a source:</td>
</tr>
<tr>
<td>• <strong>personal experience</strong>: use of personal experience or opinion related to the task theme;</td>
</tr>
<tr>
<td>• <strong>subject material</strong>: reference to subject lecture or prescribed text;</td>
</tr>
<tr>
<td>• <strong>external source</strong>: reference to appropriate material other than prescribed subject material.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organisational: referring to procedures and methods of working as a group.</td>
</tr>
<tr>
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</tr>
<tr>
<td>Debilitative: overtly critical or over-harsh reactions ('flaming').</td>
</tr>
<tr>
<td>Metacomment: comment on the outcome of group procedures or on group factors.</td>
</tr>
</tbody>
</table>

| Off-task |
Transcripts were coded based on this framework. Final coding was undertaken by the researcher and the independent coder. Consistency in coding occurred in 98.5% cases (i.e., coding of individual units of text across transcriptions). In the main, differences in coding occurred in interpretation of comments as either socio-affective or debilitative or identification of source (i.e., personal, subject material or external source).

**In-depth Interviews**

The initial coding system for analysis of the interview data was developed from the semi-structured interview guide. The system was refined through the process of 'interactive reading' of all interview transcripts (Minichiello et al, 1995). When the coding system was finalised, the qualitative data management software package, NUD*IST, was used to electronically assign text segments of each transcript to the appropriate codes. Categories within the coding system were analysed to identify patterns in responses.

**Summary**

This chapter described the research methodology utilised to carry out the second phase of the investigation which involved the implementation of collaborative learning strategies for health education in face-to-face and Web-based learning environments.
Chapter 5: Results

This chapter addresses each research question through analysis of the applicable quantitative and qualitative data collected during the investigation.

Participant Profile and Tutorial Class Composition

Sixty-two students were enrolled in the subject and all agreed to participate in the research study. The majority of the students (i.e., n=57) were enrolled in Bachelor of Education (Physical and Health Education) degree program offered by the Faculty of Education. The remaining participants were Bachelor of Arts students (n=2); exchange students (n=2); and a Bachelor of Science student (n=1). In keeping with the general cohort within the Faculty of Education, the gender balance was approximately equal. Thirty-two participants were female and 30 participants were male.

Although the age of students ranged from 18 years to 37 years, the majority fell in the 18 to 19 year age range (n=41) — again, in keeping with the general profile of students in the Faculty. This indicated that the majority of participants entered higher education (and thus, enrolment in this subject) directly upon leaving secondary school. This fact is of particular importance to the research study. In secondary schools within New South Wales there is a health-related elective subject at the senior level which focuses on personal development, health and physical education. Within this subject, aspects of health education that were explored in EDUP144: Health and Health Behaviour are covered (such as HIV/AIDS, sexuality, and nutrition). This had the potential to confound the results of the study.
Forty-one of 60 respondents reported that they had undertaken Personal Development, Health and Physical Education (i.e., 2 Unit PDHPE) as a New South Wales Higher School Certificate subject. To account for this potential confounding variable, students were randomly assigned into tutorials classes. A Chi Square was performed to determine whether the distribution of those who undertook 2 Unit PDHPE was the same in each tutorial class. No significant difference was found between classes according to whether they had done the higher school subject or not ($\chi^2=3.27, p>.05$).

Research Question One: Knowledge, Attitude and Behaviour Change

Research question one focused on knowledge attitude and behaviour change experienced by students who engaged in the subject. Specifically, the question was:

How effective is the use of a Web-based learning environment in delivering health education relative to that of the traditional face-to-face environment in terms of knowledge, attitude and behaviour change?

To respond to this question, the data related to knowledge, attitude and behaviour was analysed for each of experiment 1 and experiment 2 by answering the sub-questions:

- Irrespective of tutorial learning environment, did knowledge, attitude or behaviour change with regard to any specific aspect of HIV/AIDS (E1) or nutrition (E2)?
- Irrespective of tutorial learning environment, did knowledge, attitude or behaviour change for HIV/AIDS (E1) or nutrition (E2)?
• Was there any difference in knowledge, attitude or behaviour for the Web-based learning environment compared to the face-to-face learning environment?

Experiment 1 - HIV/AIDS-Related Learning Activities

Experiment 1 focused on collaborative learning activities that involved the exploration of HIV/AIDS. The HIV/AIDS-related Questionnaire (HRQ) administered pre- and post-intervention provided the data to respond to the research question and sub-questions. For each of the knowledge, attitude and behaviour scales, a score was calculated for each participant.

**HIV/AIDS-Related Knowledge**

The HIV/AIDS-related questionnaire included 17 knowledge items. These items were initially analysed individually. Table 5.1 provides a breakdown of the number of correct, incorrect and unsure responses and mean scores for each question for all participants regardless of treatment (i.e., Web-based or face-to-face learning environment). Descriptive data demonstrated 10 of the 17 questions saw an improvement in students' knowledge. The responses to the individual items on the scale demonstrated that, in the main, students held a high level of HIV/AIDS-related knowledge. However, they seemed to have some difficulty with concepts of behaviour change and epidemiology related to HIV/AIDS as demonstrated by the pre-test responses to questions 3 (i.e., self-efficacy is important before voluntary health behaviour change can occur) and 13 (i.e., the incidence of AIDS in women is increasing). However, they tended to improve their knowledge in these areas on the post-test.
Table 5.1: Response category counts and mean score for individual HIV/AIDS-related knowledge items.

<table>
<thead>
<tr>
<th>Knowledge Item</th>
<th>Pre M</th>
<th>Pre N</th>
<th>Post M</th>
<th>Post N</th>
<th>Correct</th>
<th>Incorrect</th>
<th>Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In relation to HIV, one high risk contact would be a serious event.</td>
<td>.867</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. The most important mode of transmission of HIV involves any exchange of body fluids.</td>
<td>.820</td>
<td>61</td>
<td>.918</td>
<td>61</td>
<td>50</td>
<td>56</td>
<td>0</td>
</tr>
<tr>
<td>3. Self-efficacy is important before voluntary health behaviour change can occur.</td>
<td>.517</td>
<td>60</td>
<td>.780</td>
<td>59</td>
<td>31</td>
<td>46</td>
<td>11</td>
</tr>
<tr>
<td>4. An injury from stepping on a discarded needle point presents a low level of risk for the transmission of HIV.</td>
<td>.787</td>
<td>61</td>
<td>.787</td>
<td>61</td>
<td>48</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>5. Once a person has contracted the HIV virus, he/she will be able to transmit the virus for the rest of his/her life.</td>
<td>.836</td>
<td>61</td>
<td>.902</td>
<td>61</td>
<td>51</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>6. HIV can be transmitted from mother to child during pregnancy.</td>
<td>.918</td>
<td>61</td>
<td>.983</td>
<td>59</td>
<td>56</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>7. Tongue kissing with a person infected with HIV is a high risk behaviour for transmitting the virus.</td>
<td>.918</td>
<td>61</td>
<td>.869</td>
<td>61</td>
<td>56</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8. Self-awareness is a precursor in the voluntary behaviour change process.</td>
<td>.847</td>
<td>59</td>
<td>.902</td>
<td>61</td>
<td>50</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>9. A person can contract HIV by coming into contact with infected breath.</td>
<td>.984</td>
<td>61</td>
<td>.967</td>
<td>61</td>
<td>60</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>10. The HIV virus actually attacks the immune system.</td>
<td>.885</td>
<td>61</td>
<td>.885</td>
<td>61</td>
<td>54</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>11. The process of health behaviour change is well understood.</td>
<td>.627</td>
<td>59</td>
<td>.541</td>
<td>61</td>
<td>37</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>12. Among women, only those who have bisexual sex partners are at risk of contracting HIV.</td>
<td>.883</td>
<td>60</td>
<td>.918</td>
<td>61</td>
<td>53</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>13. The incidence of AIDS in women is increasing.</td>
<td>.433</td>
<td>60</td>
<td>.623</td>
<td>61</td>
<td>26</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>14. Risk of AIDS can be reduced by adopting appropriate behavioural strategies.</td>
<td>.983</td>
<td>59</td>
<td>.967</td>
<td>61</td>
<td>58</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>15. HIV is not a disease.</td>
<td>.377</td>
<td>61</td>
<td>.426</td>
<td>61</td>
<td>23</td>
<td>35</td>
<td>3</td>
</tr>
<tr>
<td>16. HIV is a highly contagious virus.</td>
<td>.525</td>
<td>61</td>
<td>.557</td>
<td>61</td>
<td>32</td>
<td>22</td>
<td>7</td>
</tr>
<tr>
<td>17. Studies have shown that insect bites transmit HIV.</td>
<td>.607</td>
<td>61</td>
<td>.525</td>
<td>61</td>
<td>37</td>
<td>9</td>
<td>15</td>
</tr>
</tbody>
</table>
For each question a mean response was calculated pre- and post-intervention for all students and compared for significance. Participants significantly increased their knowledge on the following items:

- Question 1 - In relation to HIV, one high risk contact would be a serious event (p<.05).
- Question 3 - Self-efficacy is important before voluntary health behaviour change can occur (p<.05).
- Question 6 - HIV can be transmitted from mother to child during pregnancy (p<.05).
- Question 13 - The incidence of AIDS in women is increasing (p<.05).

To assess overall effectiveness of the pedagogical strategy (i.e., collaborative tutorial activities) in both Web-based and face-to-face environments, mean scores for the HIV/AIDS-related knowledge scale was calculated pre and post (see Table 5.2).

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Var</th>
<th>Range</th>
<th>Min.</th>
<th>Max.</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>12.69</td>
<td>1.92</td>
<td>3.68</td>
<td>9</td>
<td>7</td>
<td>16</td>
<td>61</td>
</tr>
<tr>
<td>Post-test</td>
<td>13.49</td>
<td>1.61</td>
<td>2.59</td>
<td>7</td>
<td>10</td>
<td>17</td>
<td>61</td>
</tr>
</tbody>
</table>

Note. t=-2.73  p<0.05

Descriptive indications from the mean scores demonstrated that participants performed better on the post-test than on the pre-test. Using a t-test for dependent samples, this indication of improvement was found to be significant (p<.05). Thus, the collaborative learning activities can be viewed as effective for increasing HIV/AIDS-related knowledge.
Figure 5.1: Pre- and post-test HIV/AIDS-related knowledge score mean for Web and face-to-face classes.

In descriptive terms, both classes improved pre to post with the class that engaged in the Web-based learning environment increasing their mean knowledge score more than the class that engaged in the face-to-face situation.

This differential in improvement was examined for significance by comparing post-test means using an ANCOVA (with the pre-test score used as the covariate) and no statistical difference was found (see Table 5.3).
Table 5.3: ANCOVA for HIV/AIDS-related knowledge post-test by tutorial class (Web or face-to-face) with pre-test score as covariate.

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covariate: HIV/AIDS-related Knowledge pre-test</td>
<td>1.491</td>
<td>1</td>
<td>1.491</td>
<td>.584</td>
<td>.448</td>
</tr>
<tr>
<td>Main Effects: Tutorial Class</td>
<td>3.204</td>
<td>1</td>
<td>3.204</td>
<td>1.254</td>
<td>.267</td>
</tr>
<tr>
<td>Explained</td>
<td>7.099</td>
<td>2</td>
<td>3.549</td>
<td>1.390</td>
<td>.257</td>
</tr>
<tr>
<td>Residual</td>
<td>148.147</td>
<td>58</td>
<td>2.554</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>155.246</td>
<td>60</td>
<td>2.587</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This lack of significance allowed for further analysis using a paired t-test with the pre and post means for the class engaged in the Web-based learning environment tested for significance. The same was undertaken for the class engaged in the face-to-face environment (see Table 5.4).

Table 5.4: Paired t-test for HIV/AIDS-related knowledge by Web and face-to-face class.

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Paired t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Web</td>
<td>12.03</td>
<td>2.09</td>
<td>13.19</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Face-to-face</td>
<td>13.37</td>
<td>1.47</td>
<td>13.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Although the ANCOVA revealed no significant difference between classes, the Web class improved significantly pre to post (p<.05) while the face-to-face class did not.
HIV/AIDS-Related Attitude

The HIV/AIDS-related questionnaire included six attitude items. Table 5.5 provides a breakdown of the number of responses for each category and mean scores for all participants regardless of learning environment (i.e., Web or face-to-face). Descriptive data demonstrated that participants' attitude related to HIV/AIDS issues moved in a more positive direction for four of the six items (pre to post). Given the program of study for these participants (i.e., physical and health education) it was interesting that the statement which received a less positive response pre to post was, "I wouldn't want to play a contact sport against someone who had HIV."

Table 5.5: Response category counts and mean score for individual HIV/AIDS-related attitude items.

<table>
<thead>
<tr>
<th>Attitude Item</th>
<th>M</th>
<th>N</th>
<th>SA</th>
<th>A</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>18. The HIV/AIDS problem is something I haven't given much thought to, as it doesn't really interest me.</td>
<td>2.967</td>
<td>61</td>
<td>1</td>
<td>8</td>
<td>44</td>
<td>8</td>
</tr>
<tr>
<td>19. I would be worried about sharing a flat with somebody with HIV because of the risk involved in catching the virus.</td>
<td>2.733</td>
<td>60</td>
<td>2</td>
<td>19</td>
<td>32</td>
<td>7</td>
</tr>
<tr>
<td>20. I would have no difficulty being friends with someone with AIDS.</td>
<td>3.197</td>
<td>61</td>
<td>21</td>
<td>32</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>21. I wouldn't accept someone else's blood, if I required a transfusion, because of the risk of HIV/AIDS.</td>
<td>3.098</td>
<td>61</td>
<td>1</td>
<td>5</td>
<td>42</td>
<td>13</td>
</tr>
<tr>
<td>22. I wouldn't want to play a contact sport against someone who had HIV.</td>
<td>2.224</td>
<td>58</td>
<td>10</td>
<td>29</td>
<td>15</td>
<td>4</td>
</tr>
<tr>
<td>23. As a physical education teacher, I would have no difficulty with having a student with HIV in my class.</td>
<td>3.246</td>
<td>61</td>
<td>21</td>
<td>35</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Note. SA= Strongly Agree, A=Agree, D=Disagree, SD=Strongly Disagree</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
For each question, the mean response was calculated pre to post and compared for significance. Statistically significant differences pre to post were found for the mean of the following items:

- Question 20 - I would have no difficulty being friends with someone with AIDS (p<.05).
- Question 23 - As a physical education teacher, I would have no difficulty with having a student with HIV in my class (p<.05).

To assess overall effectiveness of the pedagogical strategy (i.e., collaborative tutorial activities) in both the Web-based and face-to-face environments, mean scores the HIV/AIDS-related attitude scale was calculated pre and post (see Table 5.6).

Table 5.6: Pre- and post-test score analysis for HIV/AIDS-related attitude (all participants).

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Var</th>
<th>Range</th>
<th>Min.</th>
<th>Max.</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>17.31</td>
<td>2.69</td>
<td>7.22</td>
<td>15</td>
<td>7</td>
<td>22</td>
<td>61</td>
</tr>
<tr>
<td>Post-test</td>
<td>17.67</td>
<td>2.34</td>
<td>5.48</td>
<td>10</td>
<td>12</td>
<td>22</td>
<td>60</td>
</tr>
</tbody>
</table>

Note. \( t=-1.26 \) \( p>.05 \)

Descriptively, the mean scores demonstrated that the participants responded with a more positive attitude toward HIV/AIDS-related issues on the post-test than on the pre-test. This provided some indication of the effectiveness of the tutorial activities however, a t-test for dependent samples found that the difference pre to post was not significant.
To examine the effectiveness of the Web-based and face-to-face learning environments, the pre- and post-test mean scores for each class were compared. Figure 5.2 provides an illustration of the difference in mean attitude scores for the Web and face-to-face classes.

![Figure 5.2: Pre- and post-test HIV/AIDS-related attitude scale means for Web and face-to-face classes.](image)

In descriptive terms, both classes improved pre to post. However, the class that engaged in the Web-based tutorials increased their mean attitude score more than the class engaged in the face-to-face learning environment.

This differential in improvement was examined for a significant difference by comparing post-test means using an ANCOVA and no statistical difference was found (see Table 5.7).
Table 5.7: ANCOVA for HIV/AIDS-related attitude post-test by tutorial class (Web or face-to-face) with pre-test score as covariate.

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig. Of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covariate:</td>
<td>145.943</td>
<td>1</td>
<td>145.943</td>
<td>47.775</td>
<td>.000</td>
</tr>
<tr>
<td>HIV/AIDS-related Attitude Post-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Effects:</td>
<td>.029</td>
<td>1</td>
<td>.029</td>
<td>.009</td>
<td>.923</td>
</tr>
<tr>
<td>Explained</td>
<td>149.210</td>
<td>2</td>
<td>74.605</td>
<td>24.422</td>
<td>.000</td>
</tr>
<tr>
<td>Residual</td>
<td>174.124</td>
<td>57</td>
<td>3.055</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>323.333</td>
<td>59</td>
<td>5.480</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

This lack of significance allowed for further analysis using a paired t-test with the pre- and post-test means for the class engaged in the Web-based learning environment tested for significance. The same was undertaken for the class engaged in the face-to-face environment (see Table 5.8).

Table 5.8: Paired T-test for HIV/AIDS-related attitude scale.

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Paired t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
</tr>
<tr>
<td>Web</td>
<td>16.9</td>
<td>2.94</td>
<td>17.4333</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Face-to-face</td>
<td>17.7667</td>
<td>2.417</td>
<td>17.9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The increase in mean scores pre to post for both Web-based and face-to-face learning environments was found not to be significant.
HIV/AIDS-Related Behaviour

The HIV/AIDS-related questionnaire included five behaviour items. Table 5.9 provides a breakdown of the number of responses in each category and mean scores for each question for all participants regardless of treatment (i.e., Web-based or face-to-face learning environment). Descriptive data demonstrated three of the five questions saw a decrease in participants' mean score for each behaviour item pre to post.

Table 5.9: Response category counts and mean score for individual HIV/AIDS-related behaviour items.

<table>
<thead>
<tr>
<th>Behaviour Item</th>
<th>M</th>
<th>N</th>
<th>A</th>
<th>AA</th>
<th>S</th>
<th>HE</th>
<th>N</th>
<th>NA</th>
</tr>
</thead>
<tbody>
<tr>
<td>24. I use a condom when having sex.</td>
<td>4.276</td>
<td>58</td>
<td>22</td>
<td>12</td>
<td>8</td>
<td>3</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>4.143</td>
<td>56</td>
<td>21</td>
<td>12</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>25. I avoid sexual relations with new partners until I know their sexual history.</td>
<td>3.966</td>
<td>59</td>
<td>16</td>
<td>14</td>
<td>9</td>
<td>5</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td></td>
<td>3.828</td>
<td>58</td>
<td>14</td>
<td>13</td>
<td>10</td>
<td>6</td>
<td>0</td>
<td>15</td>
</tr>
<tr>
<td>26. When I go to a new doctor or dentist, I check that they follow appropriate sterilisation procedures.</td>
<td>3.656</td>
<td>61</td>
<td>10</td>
<td>9</td>
<td>9</td>
<td>18</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>3.655</td>
<td>58</td>
<td>9</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>12</td>
<td>4</td>
</tr>
<tr>
<td>27. When having sex with a partner whose sexual history I'm unsure of, I use a condom.</td>
<td>4.228</td>
<td>57</td>
<td>28</td>
<td>9</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>4.103</td>
<td>58</td>
<td>27</td>
<td>10</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>19</td>
</tr>
<tr>
<td>28. I have changed my sexual behaviour because of my knowledge and awareness of HIV/AIDS.</td>
<td>3.879</td>
<td>58</td>
<td>21</td>
<td>9</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>4.000</td>
<td>58</td>
<td>21</td>
<td>12</td>
<td>5</td>
<td>3</td>
<td>0</td>
<td>17</td>
</tr>
</tbody>
</table>

Note. A=Always, AA=Almost Always, S=Sometimes, HE=Hardly Ever, N=Never, NA=Not Applicable

T-tests for paired samples demonstrated that this decrease was not statistically significant.
To assess overall effectiveness of the pedagogical strategy (i.e., collaborative tutorial activities) in both Web-based and face-to-face environments, mean scores for the HIV/AIDS-related behaviour scale was calculated pre and post (see Table 5.10).

<table>
<thead>
<tr>
<th>M</th>
<th>SD</th>
<th>Var</th>
<th>Range</th>
<th>Min</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>19.20</td>
<td>7.29</td>
<td>53.16</td>
<td>24</td>
<td>5</td>
<td>61</td>
</tr>
<tr>
<td>Post-test</td>
<td>19.59</td>
<td>7.20</td>
<td>51.79</td>
<td>25</td>
<td>5</td>
<td>58</td>
</tr>
</tbody>
</table>

Note. $t = -.50$  $p > .05$

From an overall descriptive perspective, participants HIV/AIDS-related behaviour score increased pre to post. While a t-test for dependent samples revealed this improvement was not significant, the increased score lent some support for the effectiveness of the collaborative activities in facilitating HIV/AIDS-related behaviour change.

To examine the effectiveness of the Web-based and face-to-face learning environments, the pre and post-test mean scores were compared. Figure 5.3 provides an illustration of the difference in mean behaviour scores for the Web and face-to-face classes.
In descriptive terms, the class that engaged in the Web-based tutorials increased their mean behaviour score pre to post while the class engaged in the face-to-face learning environment decreased their mean behaviour score pre to post.

This differential in improvement was examined for a significant difference by comparing post-test means using an ANCOVA and statistical significance was not found (see Table 5.11).

Table 5.11: ANCOVA for HIV/AIDS-related behaviour post-test by tutorial class (Web or face-to-face) with pre-test score as covariate.

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig. Of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covariate:</td>
<td>1719.402</td>
<td>1</td>
<td>1719.402</td>
<td>77.519</td>
<td>.000</td>
</tr>
<tr>
<td>HIV/AIDS-related Behaviour Post-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Effects:</td>
<td>14.592</td>
<td>1</td>
<td>14.592</td>
<td>.658</td>
<td>.421</td>
</tr>
<tr>
<td>Tutorial Class Explained</td>
<td>1732.148</td>
<td>2</td>
<td>866.074</td>
<td>39.047</td>
<td>.000</td>
</tr>
<tr>
<td>Residual</td>
<td>1219.921</td>
<td>55</td>
<td>22.180</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2952.069</td>
<td>57</td>
<td>51.791</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
This allowed for further analysis using a paired t-test with the pre and post means for the class engaged in the Web-based learning environment tested for significance. The same was undertaken for the class engaged in the face-to-face environment (see Table 5.12). Statistical significance was not found.

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Post-test</th>
<th>Paired t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web</td>
<td>M 19.2143 SD 7.937</td>
<td>M 20.0714 SD 7.373</td>
<td>t=-1.19 p&gt;.05</td>
</tr>
<tr>
<td>Face-to-face</td>
<td>M 19.3 SD 6.503</td>
<td>M 19.1333 SD 7.123</td>
<td>t=.16 p&gt;.05</td>
</tr>
</tbody>
</table>

The results of experiment 1 demonstrated that, while significance was not always realised, descriptive trends favour the use of collaborative learning activities and the Web-based learning environment.
Experiment 2 - Nutrition-Related Learning Activities

Experiment 2 focused on collaborative learning activities that involved the exploration of nutrition. The Nutrition-related Questionnaire (NRQ) administered pre- and post-intervention provided the data to respond to the question for the case of experiment two. For each of the knowledge, attitude and behaviour scales, a score was calculated for each participant.

**Nutrition-Related Knowledge**

The nutrition-related questionnaire included 16 knowledge items. These items were analysed individually. Table 5.13 provides a breakdown of the number of correct, incorrect and unsure responses and mean scores for each question for all participants regardless of treatment (i.e., Web-based or face-to-face learning environment). Descriptive data demonstrated 13 of the 16 questions saw an improvement in participants' knowledge. Participants held a fairly high level of nutrition-related knowledge as evidenced by pre-test responses.
Table 5.13: Response category counts and mean score for individual nutrition-related knowledge items.

<table>
<thead>
<tr>
<th>Knowledge Item</th>
<th>Pre</th>
<th>N</th>
<th>Correct</th>
<th>Incorrect</th>
<th>Unsure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. One way for people to increase the amount of fibre in their diets is to eat more fruit.</td>
<td>.627</td>
<td>59</td>
<td>37</td>
<td>17</td>
<td>5</td>
</tr>
<tr>
<td>2. Fat is the main energy source for the body.</td>
<td>.797</td>
<td>59</td>
<td>47</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>3. Dietary fibre is soluble or insoluble in the large intestine.</td>
<td>.746</td>
<td>59</td>
<td>44</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>4. Calcium supplements are necessary to prevent osteoporosis.</td>
<td>.746</td>
<td>59</td>
<td>44</td>
<td>9</td>
<td>7</td>
</tr>
<tr>
<td>5. Anorexia nervosa is related to a distorted body image.</td>
<td>.797</td>
<td>59</td>
<td>47</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>6. Vitamins are essential organic compounds that promote growth and reproduction and help maintain life and health.</td>
<td>.797</td>
<td>59</td>
<td>47</td>
<td>8</td>
<td>4</td>
</tr>
<tr>
<td>7. Weight reduction causes a decrease in the number of fat cells.</td>
<td>.525</td>
<td>59</td>
<td>31</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>8. People with bulimia are underweight.</td>
<td>.610</td>
<td>59</td>
<td>36</td>
<td>20</td>
<td>3</td>
</tr>
<tr>
<td>9. Fibre helps reduce the risk of some types of cancer.</td>
<td>.644</td>
<td>59</td>
<td>38</td>
<td>16</td>
<td>5</td>
</tr>
<tr>
<td>10. Diet has only a small role to play in terms of a risk factor for the leading causes of death.</td>
<td>.864</td>
<td>59</td>
<td>51</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>11. Malnutrition refers to caloric insufficiency in diet.</td>
<td>.864</td>
<td>59</td>
<td>51</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>12. Foods that are low in cholesterol are low in fat.</td>
<td>.525</td>
<td>59</td>
<td>31</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>13. Diets that are very low in calories can cause serious health problems.</td>
<td>.525</td>
<td>59</td>
<td>31</td>
<td>21</td>
<td>7</td>
</tr>
<tr>
<td>14. A loss of 20% of water will result in death.</td>
<td>.508</td>
<td>59</td>
<td>30</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td>15. Eggs are a common food allergy.</td>
<td>.508</td>
<td>59</td>
<td>30</td>
<td>18</td>
<td>11</td>
</tr>
<tr>
<td>16. Athletes who engage in carbohydrate loading should concentrate on simple rather than complex carbohydrates.</td>
<td>.508</td>
<td>59</td>
<td>30</td>
<td>18</td>
<td>11</td>
</tr>
</tbody>
</table>
T-tests for paired samples demonstrated that participants improved significantly on their responses to the questions:

- Question 1 - One way for people to increase the amount of fibre in their diets is to eat more fruit (p<.05).
- Question 7 - Weight reduction causes a decrease in the number of fat cells (p<.05).
- Question 12 - Foods that are low in cholesterol are low in fat (p<.05).
- Question 13 - Diets that are very low in calories can cause serious health problems (p<.05).

To assess overall effectiveness of the pedagogical strategy (i.e., collaborative tutorial activities) in both Web-based and face-to-face environments, mean scores for the nutrition-related knowledge scale were calculated pre and post (see Table 5.14).

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Var</th>
<th>Range</th>
<th>Min.</th>
<th>Max.</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>9.8</td>
<td>2.38</td>
<td>5.65</td>
<td>12</td>
<td>3</td>
<td>15</td>
<td>59</td>
</tr>
<tr>
<td>Post-test</td>
<td>10.98</td>
<td>2.24</td>
<td>5.00</td>
<td>9</td>
<td>6</td>
<td>15</td>
<td>60</td>
</tr>
</tbody>
</table>

Note. t=-3.94 p>.05

From a descriptive perspective, participants performed better on the post-test than the pre-test. Thus, the collaborative learning activities can be viewed as having some level of effectiveness for increasing nutrition-related knowledge regardless of the learning environment (Web or face-to-face) in which learners were engaged.
To examine the effectiveness of the Web-based and face-to-face learning environments, the pre- and post-test mean scores were compared. Figure 5.4 provides an illustration of the difference in mean nutrition-related knowledge scores for the Web and face-to-face classes.

In descriptive terms, both classes improved pre to post. However, the class that engaged in the face-to-face learning environment increased their mean knowledge score more than the class that engaged in the Web-based tutorials.

This differential in improvement was examined for a significant difference by comparing post-test means using an ANCOVA and no statistical difference was found (see Table 5.15).
Table 5.15: ANCOVA for nutrition-related knowledge post-test by tutorial class (Web or Face-to-face) with pre-test score as covariate.

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covariate:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrition-related Knowledge</td>
<td>75.458</td>
<td>1</td>
<td>75.458</td>
<td>19.718</td>
<td>.000</td>
</tr>
<tr>
<td>Post-test</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Main Effects:</td>
<td>2.873</td>
<td>1</td>
<td>2.873</td>
<td>.751</td>
<td>.390</td>
</tr>
<tr>
<td>Tutorial Class</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Explained</td>
<td>75.458</td>
<td>2</td>
<td>37.729</td>
<td>9.859</td>
<td>.000</td>
</tr>
<tr>
<td>Residual</td>
<td>210.473</td>
<td>55</td>
<td>3.827</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>285.931</td>
<td>57</td>
<td>5.016</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Further analysis was conducted using a paired t-test with the pre and post means for the class engaged in the Web-based learning environment tested for significance. The same was undertaken for the class engaged in the face-to-face environment (see Table 5.16). While both classes increased their knowledge score pre to post, the improvement for the class engaged in the face-to-face tutorials was found to be statistically significant (p<.05).

Table 5.16: T-tests for nutrition-related knowledge scale.

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th></th>
<th>Post-test</th>
<th></th>
<th>Paired t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
</tr>
<tr>
<td>Web</td>
<td>10.3214</td>
<td>2.074</td>
<td>11.0357</td>
<td>2.487</td>
<td>t=-1.77</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>p&gt;.05</td>
</tr>
<tr>
<td>Face-to-face</td>
<td>9.4</td>
<td>2.568</td>
<td>11.033</td>
<td>2.025</td>
<td>t=-3.75</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>p&lt;.05</td>
</tr>
</tbody>
</table>
Nutrition-Related Attitude

The nutrition-related questionnaire included seven attitude items. Questions on the attitude scale were analysed individually. Table 5.17 provides a breakdown of the number of responses in each category and mean scores for each question for all participants regardless of treatment (i.e., Web-based or face-to-face learning environment). Descriptive data demonstrated that five of the seven questions saw change in participants' attitude related to nutrition-related issues in a positive direction.

Table 5.17: Response category counts and mean score for individual nutrition-related attitude items.

<table>
<thead>
<tr>
<th>Attitude Item</th>
<th>M</th>
<th>N</th>
<th>SA</th>
<th>A</th>
<th>D</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Eating a healthy diet is important to me.</td>
<td>Pre</td>
<td>3.627</td>
<td>59</td>
<td>37</td>
<td>22</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>3.567</td>
<td>60</td>
<td>34</td>
<td>26</td>
<td>0</td>
</tr>
<tr>
<td>18. The pleasures of eating are more important than being concerned about the nutritional content of food.</td>
<td>Pre</td>
<td>2.768</td>
<td>56</td>
<td>1</td>
<td>16</td>
<td>34</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>2.867</td>
<td>60</td>
<td>1</td>
<td>11</td>
<td>43</td>
</tr>
<tr>
<td>19. Body image is not a critical health issue.</td>
<td>Pre</td>
<td>3.017</td>
<td>58</td>
<td>0</td>
<td>13</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>3.367</td>
<td>60</td>
<td>1</td>
<td>2</td>
<td>31</td>
</tr>
<tr>
<td>20. Nutrition should be de-emphasised as a health concern.</td>
<td>Pre</td>
<td>3.373</td>
<td>59</td>
<td>1</td>
<td>3</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>3.433</td>
<td>60</td>
<td>1</td>
<td>3</td>
<td>25</td>
</tr>
<tr>
<td>21. Most people do not have to be concerned about nutrition.</td>
<td>Pre</td>
<td>3.362</td>
<td>58</td>
<td>0</td>
<td>2</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>3.283</td>
<td>60</td>
<td>1</td>
<td>2</td>
<td>36</td>
</tr>
<tr>
<td>22. Body image is overemphasised in society.</td>
<td>Pre</td>
<td>3.124</td>
<td>56</td>
<td>16</td>
<td>37</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>3.350</td>
<td>60</td>
<td>25</td>
<td>32</td>
<td>2</td>
</tr>
<tr>
<td>23. The relationship between nutrition and disease is overrated.</td>
<td>Pre</td>
<td>3.254</td>
<td>59</td>
<td>0</td>
<td>0</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td>Post</td>
<td>3.333</td>
<td>60</td>
<td>0</td>
<td>1</td>
<td>38</td>
</tr>
</tbody>
</table>

Note. SA= Strongly Agree, A=Agree, D=Disagree, SD=Strongly Disagree
T-tests for paired samples demonstrated that difference in pre and post-test mean scores was significant for question 19 (i.e., Body image is not a critical health issue).

To assess overall effectiveness of the pedagogical strategy (i.e., collaborative tutorial activities) in both Web-based and face-to-face environments, mean scores for the nutrition-related attitude scale were calculated pre and post (see Table 5.18).

Table 5.18: Pre and post-test score analysis for nutrition-related attitude for all participants.

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Var</th>
<th>Range</th>
<th>Min.</th>
<th>Max.</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>22.2</td>
<td>2.51</td>
<td>6.30</td>
<td>11</td>
<td>16</td>
<td>27</td>
<td>59</td>
</tr>
<tr>
<td>Post-test</td>
<td>23.20</td>
<td>2.08</td>
<td>4.33</td>
<td>10</td>
<td>18</td>
<td>28</td>
<td>60</td>
</tr>
</tbody>
</table>

Note. t=-2.97 p<0.05

Descriptive indications from the means scores demonstrated that participants performed better on the post-test than on the pre-test. Using a t-test for dependent samples, this indication of improvement was found to be significant. Thus, the collaborative learning activities can be viewed as effective for facilitating nutrition-related attitude change.

To examine the effectiveness of the Web-based and face-to-face learning environments, the pre and post-test mean scores for the nutrition-related attitude scale were compared. Figure 5.5 provides an illustration of the difference in mean knowledge scores for the Web and face-to-face classes.
Figure 5.5: Pre and post-test nutrition attitude scale means for Web and face-to-face classes.

In descriptive terms, both classes improved pre to post. However, the class that engaged in the Web-based learning environment increased their mean knowledge score more than the class that engaged in the face-to-face tutorials.

This differential in improvement was examined for a significant difference by comparing post-test means using an ANCOVA and statistical significance was found (see Table 5.19).

Table 5.19: ANCOVA for nutrition-related attitude post-test by tutorial class (Web or face-to-face) with nutrition-related attitude pre-test score.

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig. of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covariate: Nutrition-related Attitude Post-test</td>
<td>28.029</td>
<td>1</td>
<td>28.029</td>
<td>7.383</td>
<td>.009</td>
</tr>
<tr>
<td>Main Effects: Tutorial Class Explained</td>
<td>4.389</td>
<td>1</td>
<td>4.389</td>
<td>1.156</td>
<td>.287</td>
</tr>
<tr>
<td>Residual</td>
<td>208.802</td>
<td>55</td>
<td>3.796</td>
<td>4.111</td>
<td>.022</td>
</tr>
<tr>
<td>Total</td>
<td>240.017</td>
<td>57</td>
<td>4.211</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Nutrition-Related Behaviour**

The nutrition-related questionnaire included a scale of five behaviour items. These items were analysed individually. Table 5.20 provides a breakdown of the number of responses in each category and mean scores for each question for all participants regardless of treatment (i.e., Web-based or face-to-face learning environment). Descriptive data demonstrated that three of the five questions saw a change in participants' nutrition-related behaviour responses in a positive direction.

Table 5.20: Response category counts and mean score for individual nutrition-related behaviour items.

<table>
<thead>
<tr>
<th>Behaviour Item</th>
<th>Pre M</th>
<th>N</th>
<th>A</th>
<th>AA</th>
<th>S</th>
<th>HE</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>24. I eat a healthy, balanced diet.</td>
<td>3.702</td>
<td>57</td>
<td>2</td>
<td>37</td>
<td>17</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3.717</td>
<td>60</td>
<td>3</td>
<td>37</td>
<td>20</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>25. I put a lot of effort into understanding the nutritional value of what I eat.</td>
<td>3.271</td>
<td>59</td>
<td>2</td>
<td>20</td>
<td>25</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3.237</td>
<td>59</td>
<td>2</td>
<td>21</td>
<td>26</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>26. My food choices are determined by convenience rather than by nutritional value.</td>
<td>3.051</td>
<td>59</td>
<td>1</td>
<td>13</td>
<td>27</td>
<td>18</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3.033</td>
<td>60</td>
<td>0</td>
<td>13</td>
<td>34</td>
<td>11</td>
<td>2</td>
</tr>
<tr>
<td>27. Nutritional issues guide my eating patterns.</td>
<td>3.121</td>
<td>58</td>
<td>1</td>
<td>14</td>
<td>34</td>
<td>9</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3.250</td>
<td>60</td>
<td>2</td>
<td>17</td>
<td>36</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>28. On balance, I select food according to the health value rather than any other factor.</td>
<td>3.345</td>
<td>58</td>
<td>3</td>
<td>20</td>
<td>29</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3.373</td>
<td>59</td>
<td>3</td>
<td>24</td>
<td>25</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

T-tests for paired samples demonstrated that there was no significant difference in pre and post-test mean scores for individual questions on the nutrition-related behaviour scale.
To assess overall effectiveness of the pedagogical strategy (i.e., collaborative tutorial activities) in both Web-based and face-to-face environments, mean scores for the nutrition-related attitude scale were calculated pre and post (see Table 5.21).

Table 5.21: Pre and post-test score analysis for nutrition-related behaviour for all participants.

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>Var</th>
<th>Range</th>
<th>Min.</th>
<th>Max.</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>16.25</td>
<td>3.19</td>
<td>10.19</td>
<td>14</td>
<td>9</td>
<td>23</td>
<td>59</td>
</tr>
<tr>
<td>Post-test</td>
<td>16.5</td>
<td>2.88</td>
<td>8.29</td>
<td>15</td>
<td>10</td>
<td>25</td>
<td>60</td>
</tr>
</tbody>
</table>

Note: $t=-1.01$ $p>.05$

Descriptive indications from the mean scores demonstrated that participants performed better on the post-test than on the pre-test. Thus, the collaborative learning activities can be viewed to have some degree of effectiveness for facilitating nutrition-related behaviour change. However, a $t$-test for dependent samples indicated that this difference in mean scores was not significant.

To examine the effectiveness of the Web-based and face-to-face learning environments, the pre and post-test mean scores for the nutrition-related behaviour scale were compared. Figure 5.6 provides an illustration of the difference in mean knowledge scores for the Web and face-to-face classes.
Figure 5.6: Pre and Post-test nutrition behaviour scale means for Web and face-to-face classes.

In descriptive terms, the class that engaged in the Web-based learning environment increased their mean behaviour score while the class that engaged in the face-to-face tutorials decreased their mean behaviour score.

This differential in improvement was examined for a significant difference by comparing post-test means using an ANCOVA (with the pre-test scores used as a covariate) and statistical significance was not found (see Table 5.22).

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Squares</th>
<th>DF</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig. Of F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Covariate:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrition-related Behaviour Post-test</td>
<td>234.716</td>
<td>1</td>
<td>234.716</td>
<td>73.798</td>
<td>.000</td>
</tr>
<tr>
<td>Main Effects:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tutorial Class Explained</td>
<td>15.588</td>
<td>1</td>
<td>15.588</td>
<td>4.901</td>
<td>.031</td>
</tr>
<tr>
<td>Residual</td>
<td>174.93</td>
<td>55</td>
<td>3.181</td>
<td>.000</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>439.103</td>
<td>57</td>
<td>7.704</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Further analysis was conducted using a paired t-test with the pre and post means for the class engaged in the Web-based learning environment tested for significance. The same was undertaken for the class engaged in the face-to-face environment (see Table 5.23). Change in mean score pre to post was not found to be significant for either the Web-based or face-to-face class.

<table>
<thead>
<tr>
<th>Table 5.23: T-test for nutrition-related behaviour scale.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Pre-test</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>M</td>
</tr>
<tr>
<td>Web</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Face-to-face</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>
Research Question One: Analysis Summary

The analysis related to research question one for both experiments is summarised in Table 5.24.

<table>
<thead>
<tr>
<th>Did students improve pre to post regardless of tutorial environment?</th>
<th>Did Web class perform better than face-to-face class pre to post?</th>
<th>For the group engaging in Web tutorials, was the change significant?</th>
<th>For the group engaging in face-to-face tutorials, was the change significant?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Attitude</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Behaviour</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

| Knowledge | Yes | No | No | No | Yes | No | Yes | Yes |
| Attitude | Yes | Yes | Yes | Yes | Yes | Yes | Yes | No |
| Behaviour | Yes | No | Yes | No | Yes | No | Yes | No |

The Web-based learning environment proved to be as effective as the face-to-face environment for facilitating health-related knowledge construction and attitude and behaviour change. Descriptive indices point to effectiveness for the Web-based environment. Thus, in revisiting the hypotheses associated with research question, the null was stated as,

There will be no difference between the effect of the Web and the face-to-face environment on knowledge, attitude and behaviour related to health education.
In statistically significant terms, the null must be accepted. However, in broad research terms, descriptive indices provide indications of practical significance in favour of Web-based learning environments for health education.

**Research Question Two:**

Research question two focused on the nature of the interactions among members of each learning group as they worked on the collaborative activities in both the face-to-face and Web environments. Specifically, the question was:

**How do learners participate in and contribute to collaborative health education learning activities within Web-based and face-to-face learning environments?**

The data that informed this question were in the form of electronic logs and audio tape recordings of the group interactions during the intervention. The in-depth interviews, with a randomly selected representative of each learning group, triangulated the patterns observed through analysis of the recorded interactions.

A pattern of contributions by group members emerged within the Web-based learning environment that was different from the face-to-face tutorials. Contributions were analysed as inputs (i.e., a single entry within the Web-based Discussion Area or continuous speech by an individual within the face-to-face environment). And each input was made up of one or more units (i.e., statement or question). Generally, far fewer inputs were made within the Web-based tutorials in both experiment 1 and experiment 2. However, learning group members tended to provide much greater
detail in their individual inputs within the Web-based tutorials. Whereas face-to-face
group members tended to only contribute one statement or question as an input,
within Web-based tutorials contributions tended to consist of approximately three to
four sentences. Tables 5.25 and 5.26 show the number of inputs and units per input
for each tutorial in experiment 1 and experiment 2.

Table 5.25: Experiment 1 - Learning group collaborations. Number of inputs
and units per input by class (i.e., Web or face-to-face).

<table>
<thead>
<tr>
<th>Tutorial 4</th>
<th>Tutorial 4</th>
<th>Tutorial 5</th>
<th>Tutorial 5</th>
<th>Tutorial 6</th>
<th>Tutorial 6</th>
</tr>
</thead>
<tbody>
<tr>
<td># Inputs</td>
<td>Units/Input</td>
<td># Inputs</td>
<td>Units/Input</td>
<td># Inputs</td>
<td>Units/Input</td>
</tr>
<tr>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
</tr>
<tr>
<td>Web</td>
<td>21.86</td>
<td>12.5</td>
<td>3.3</td>
<td>3.7</td>
<td>7</td>
</tr>
<tr>
<td>Face-to-face</td>
<td>92.8</td>
<td>15.6</td>
<td>1.1</td>
<td>.05</td>
<td>126.8</td>
</tr>
</tbody>
</table>

Transcripts of the group interactions within the face-to-face and Web-based learning
environment were coded using the collaborative learning analysis framework. Figures
5.7 and 5.8 provide an illustration of the nature of the contributions within the face-
to-face and Web-based learning environments.
Figure 5.7: E1 - HIV/AIDS collaboration analysis face-to-face and Web (combined, synchronous and asynchronous) classes.
Figure 5.8: E2 - Nutrition collaboration analysis face-to-face and Web (combined, synchronous and asynchronous) classes.
Patterns in the nature of the collaborations that occurred in the face-to-face and Web-based learning environments emerged.

More varied discussion related to the problem was observed in the face-to-face tutorials. Within the Web-based tutorials discussion related to the problem focused on propositions of new topics for discussion and elaboration and clarification on the initial propositions. Students elaborated on ideas and challenged their group members with requests for clarification more so in the face-to-face rather than Web-based learning environment. However, groups engaging in the Web-based tutorials, particularly in asynchronous mode, tended to summarise contributions of group members more than in the face-to-face tutorials indicating that reflection on prior contributions occurred in the Web environment.

Groups using the Web-based learning environment provided more contributions related to the task goal of the problem than those engaging in the face-to-face tutorials. This suggests that the Web-based learning environment fostered a focus on the outcome of the problem.

References to sources (whether personal experience, subject material or external resources) were made in the Web-based tutorials more often than in the face-to-face tutorials. It was interesting to note that references to external resources were made by groups who engaged in Web-based tutorials during experiment 1 and by the
groups who engaged in the face-to-face tutorials during experiment 2 (i.e., the same tutorial class of students).

References to personal experiences were made in the Web-based tutorials more than the face-to-face tutorials. This supported the notion of the non-confronting environment facilitated by the Web. There was a particular focus on personal experience and/or opinion for tutorial activities associated with experiment 2 which explored concepts of body image.

Groups in both the face-to-face and Web-based environments made contributions that referred to procedures of working together. This seemed to be especially important for groups who chose to use the Web-based learning environment in an asynchronous fashion.

Groups tended to make more socio-affective contributions in Web-based tutorials than in face-to-face tutorials. This was particularly the case for those groups who used the Web environment in a synchronous fashion.

During the in-depth interviews, representatives of each learning group were asked to comment on and compare the participation and interaction among their learning group members in both the face-to-face and the Web-based tutorials.

Based on the students’ responses it seemed that during face-to-face weeks, for five of 14 learning groups, all group members worked on all aspects of the learning activity and contributed to the final response. Six of the 14 learning groups tended to
separate the task into components and delegate components to individual group members. Finally, one member of the group would be responsible for compiling together the individual components into a final response. These groups tended to commence the learning activity together to discuss some basic concepts related to the activity. One student explained,

*We worked together when we were in the tutorial [classroom], working out the answers vaguely and then we broke the questions up. Then each one took one [question] home and one person took it home and typed it up. So the basic idea was the group idea but the elaboration was the individual. It was okay, but it wasn't as good as the Web.*

Alternatively, for some groups the initial face-to-face discussion focused on group organisation for task completion. The representative for one such learning group explained, "We'd have an initial discussion in class, but the initial discussion was basically to decide who was going to do what part of the task."

For two of the 14 learning groups, only a subset of members worked on the learning activity and final response. One group did not specify a particular pattern of group task organisation.

The pattern of group organisation was different during the weeks when tutorials were conducted in the Web-based learning environment. Representatives of all learning groups noted that, during these weeks, all group members contributed to all aspects of the task by completing the individual introduction page and contributing within the *Discussion Area* within the *Activity Centre* of the Web-based learning environment.
To complete the group *Submit Page* (i.e., the final group response), eight of the 14 groups explained that they delegated the responsibility of synthesising the contributions within the *Discussion Area* to one group member. Four learning groups completed the final group response together. For some of these groups, the process entailed group members sitting around one computer to complete the *Submit Page*. Two of the learning groups did not follow a specific pattern of group organisation for the Web-based tutorials.

It would seem that the above-noted patterns of group organisation resulted in more equal participation of group members across all components of each learning activity within the Web-based tutorials (as opposed to the face-to-face tutorials). However, there was some disagreement on whether more of a 'group effort' was experienced in the Web-based or face-to-face tutorials. Representatives of three learning groups felt that the participation of members was unequal in both face-to-face and Web-based learning environments. For these groups, lack of commitment on the part of particular members, as well as process and organisational issues, became a problem. As a result, the learning task and final group response tended to fall to a subset of dedicated members.

Representatives from these (and other) learning groups commented that they would benefit from suggestions on how to better manage the group process when engaging in Web-based tutorials. Some students mentioned instances when they were unsure when their learning group members would be logging on to the Web site or how the final group product was going to be organised. However, many also noted that they experienced similar issues for face-to-face tutorials (e.g., difficulty organising meeting
times, group members failing to complete tasks, etc.). Some students stated that the
difficulty in arranging time to meet face-to-face resulted in a lack of cohesive group
effort on the learning activity. One student explained,

*We'd try to get as much in [the classroom meeting]. But, we'd never
finish it. Usually we'd make a time to meet and finish it off. Sometimes, if
it was too hard to meet, people would take different parts and do it on
their own and then hand it in together.*

Representatives from two learning groups felt that they had experienced equal
participation among group members in both the face-to-face and Web-based learning
environments. These interviewees reported that their group was cohesive and
members tended to have equally high levels of commitment in engaging in the learning
activities and completing the group response.

Four interviewees felt that they had experienced equal participation among group
members in both the face-to-face and Web-based tutorials. However, they identified
strengths and weaknesses of both environments that resulted in the nature of the
interactions among the group being different in the face-to-face and Web-based
learning environments. Similarly, advantages and disadvantages of both learning
environments in terms of the impact on the nature of the interactions among group
members were expressed by the five interviewees who felt that they had experienced
more equality in participation among group members in the Web-based tutorials.

An advantage of the Web-based learning environment in terms of equality of
participation among group members was expressed by one interviewee,
[The Web] allowed a lot more discussion. We all did our individual responses; we all did it by ourselves. Straight after we went to the Discussion Area and we all had input. You know, 'ah this point was good of Tommy's' or someone else of the group. But, [in the face-to-face tutorials] we had the basic group idea but we all took different questions home and did it all ourselves.

Another interviewee explained that a dynamic discussion within the Web-based tutorials occurred once they became accustomed to the learning environment and organised their group to interact synchronously.

*The first week we were all over the place. We thought everyone would just get on there and put their comments. But, it didn't turn into much of a discussion. It was just individual points not people refuting or arguing other people's points. Rhonda, or whoever wrote it up, just took different people's points. Whoever had the best point. So after that we all agreed to meet on the Web at seven o'clock or thereabouts and got a bit of a discussion going. That was for the second and third week. And that worked heaps better because then we could argue points. [It was] more of a group effort and discussion and if someone came up with a point and they didn't quite agree they could say, 'I agree with this but this is different and could you change this.'*

However, for some groups who were unable to manage the collaborative process, the asynchronicity of the Web-based learning environment had an impact on the nature of the discussion. One student explained,
The comments that were made were probably a bit more direct on the Web because you just had your own space there. When you're in class and doing it as a discussion with your group you tend to bounce ideas off each other more. But with the tute on the Web you're writing your answers and someone isn't there to say 'what about this' or 'could you change that' type of thing. When we were talking in our tutes in the classroom everyone was like building off each other's ideas.

Nevertheless, an advantage of the Web-based learning environments expressed by most participants in the in-depth interviews supported the observation that more detailed contributions were made within the Web-based environment. One student noted that,

*I think it [the Web tutorial] makes you express what you think more because you're not talking. When we would meet to talk... one person would say what they think then the others would just say, 'yeah, I agree'.*

A representative from another learning group also found differences in the nature of the contributions in the two learning environments,

*... [in the face-to-face tutorials] we didn't really speak. We all agreed. Like so and so said something and we'd say 'yeah, that sounds good.' I don't know why, but we all had more input when we were doing it on the Web. I guess because we would write our own answers and then we took a bit of everybody's. It was more thought out. Face-to-face everyone seemed to agree and didn't have any more input. As we were working by*
ourselves on the Web, it made us think a lot more, it was more personal and we thought it out as a group more. Yeah, I found that the Web was a lot more involved and better for discussing.

Another interviewee expressed their perception of the difference in the nature of the interactions between the two learning environments,

I mean, everyone was reading [the contributions in the Discussion Area]. And then if someone was having a problem we sort of passed the ball to someone else. It was good because, pretty much you have to read it to see where you're going. But, in the classroom you can switch off.

This student went on to explain,

Yeah, I think in the classroom at first people were a bit standoffish; didn't really know how much to participate. But, when we got into the Internet everyone sort of had to discuss; they had to do their own Individual Responses thing. Then once we'd done that, it was like a warm up for the actual page so there was more effort from everyone.

Some interviewees felt this detailed contribution in the Web-based tutorials was due to the fact that the Web takes away the pressure of the face-to-face environment. One student explained,

Some people would be sort of afraid to come out and say things. But on the Web, people aren't directly looking at you and you're not the focus of
attention. On the Web, in great detail, you can tell someone about something. But in the classroom you don't tend to go into a lot of detail...

I think for people who are reluctant to let everything out in the classroom, [the Web] is a really good opportunity, you don't have any pressure on you.

This particular student went on to explain that she noticed a difference in her own contribution,

*I think I contributed a lot more on the Web than I do in the classroom, I tend to sit back and listen and just throw something in every now and then... In the classroom, if you've got very talkative people in your group, chances are that you'll sit back and let them run the show. But when you're on the Web you're free to make a huge contribution if you want to, so you write as much as you want ... you say a lot more on the Web than you would in the class, I think.*

The pattern of learning groups delegating one member to collate components of the learning tasks that were contributed by individual members in the face-to-face tutorials or synthesising the group discussion in the Web-based tutorials was noted as a disadvantage by some interviewees. One student explained that they would have liked to view the final response before it was submitted by the group delegate and attempted to develop a suggestion as to how this might occur for the Web-based tutorials.

*Maybe for the deadline for [contributions to the Discussion Area] to be a couple days before [the deadline for final group response] for all of us to*
Research Question Three:

Research question three focused on the learners' perceptions of engaging in collaborative tutorial activities in both the face-to-face and Web-based environments. Specifically, the question was:

**What are learners' perceptions of the effectiveness of Web-based learning environments for health education?**

The data that informed this question was collected via two sources:

1. The survey administered to all participants at the conclusion of the subject (i.e., when all students had engaged in both experiments and thus both face-to-face and Web-based learning environments.

2. The in-depth interviews with a randomly selected representative from each learning group (n=7 for experiment 1 and n=7 for experiment 2).

Of the 59 students who responded to the survey question related to facilitating understanding of the subject matter covered, 83% (n=49) felt that the Web-based tutorials were "as effective" or "more effective" than the face-to-face tutorials.

This information was compared with a gain score on the knowledge scale of the HIV/AIDS related questionnaire for those students who engaged in the HIV/AIDS Web tutorials and nutrition Web tutorials (see Tables 5.27 and 5.28). Gain scores
were dichotomised into 'increased' or 'decreased' with those students undergoing no change being collapsed into the decreased category.

Table 5.27: Student perception of Web-based tutorial effectiveness related to HIV/AIDS knowledge scale gain scores.

<table>
<thead>
<tr>
<th>Knowledge Score</th>
<th>Increased</th>
<th>Decreased</th>
<th>Total N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Web more effective or as effective than face-to-face</td>
<td>17</td>
<td>10</td>
<td>27</td>
</tr>
<tr>
<td>Web less effective than face-to-face</td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Total N</td>
<td>19</td>
<td>11</td>
<td>30</td>
</tr>
</tbody>
</table>

Table 5.27 demonstrates descriptively that, in terms of gain scores for the knowledge domain during experiment 1, proportionally more students who engaged in the Web-based learning environment improved than did not improve. And, of those students who improved, more felt the Web tutorials were more effective or as effective than the face-to-face tutorials in facilitating their understanding of the subject matter. Even for those students who did not improve pre to post, more felt that the Web tutorials were more effective or as effective than the face-to-face tutorials in facilitating their understanding of the subject matter. Although these differences in percentages did not achieve statistical significance ($\chi^2=0.96, p>0.05$), they were of practical importance. The Web-based tutorials were perceived as achieving results in learning and indices pointed, although not significantly, in this direction.
Table 5.28 demonstrates that, in terms of gain scores for the knowledge domain during experiment 2, more students who engaged in the Web-based learning environment improved than did not improve. And, of those students who improved, more felt the Web tutorials were more effective or as effective than the face-to-face tutorials for facilitating their understanding of the subject matter. Even for those students who did not improve pre to post, more felt that the Web tutorials were more effective or as effective than the face-to-face tutorials in facilitating their understanding of the subject matter. While these differences in percentages did not achieve statistical significance ($\chi^2=.82, p>.05$), again they were of practical importance as Web-based tutorials were perceived as achieving results in learning.

Students also reported that they enjoyed the experience of engaging in the Web-based learning environment. Eighty-three percent of the students agreed with the survey statement "I enjoyed using the Web site for the EDUP144 tutorials".

During the in-depth interviews, all representatives of the learning groups expressed positive opinions on their experience of engaging in the Web-based tutorials.
one student had previously experienced a subject which was supported with Web-based learning materials, none of the students interviewed had previously engaged in collaborative group learning activities using the Web. They felt it was a "novelty"; a "... buzz to sit down and talk to three other people in different places"; and that "... it intrigued you because it was new and because it was different." Overwhelmingly students mentioned the benefit of the "convenience" and "flexibility" of engaging in the Web-based tutorials.

More importantly, the interview data provided explanatory support to the students' perception of effectiveness. Many suggested the flexibility afforded by the asynchronous Web-based environment contributed to its efficacy for learning as it supported reflection and individual inquiry. As one student reported:

...it's been really good because of the flexibility of being able to decide when you want to do the tutorial in your timetable. When you're all rushed, you won't concentrate but when you've got time for it, you can sit down, think about it. A couple of times I'd go off and read some books that I had at home to help me a bit and make me think more about the answer and then I could come back to it. Whereas, when in the class you've got to know straight away, right there

Another student referred to the self-directed aspect of Web-based tutorials and explained,

It's up to you to find out what you want to know. If you don't want to look anything up you don't have to. But it's there in front of you. Because you're looking it up yourself, you're taking the information in yourself.
It's not like someone is dishing it out to you, 'this is what you have to learn'. You read things: you're finding it out yourself. I like that way better because I take more in that way. I've gone to the effort, I'm going to read it and take more in.

This comment was supported by another interviewee who said,

It's like self-teaching so it's teaching you responsibility and to do it by yourself. To be able to do it by yourself and be able to learn things by yourself. It made me think about my answer more from my own knowledge than looking through a text book to find the answer... I basically just thought about it more and answered the questions.

This theme of reflection was continuously mentioned by interviewees. The opportunity to retain a record of the discussion was considered important.

One student noted

[On the Web], everybody puts in their contribution and it's displayed so everybody gets to view what you think of the subject or your information. But in the classroom, it's more a verbal thing were you can say something and then it's just gone seconds later so it's not really relevant. But, the hard copy's there on the Web.

This opportunity for individual inquiry in terms of researching the topics being explored via the subject Web site was mentioned as a factor that contributed to the effectiveness of the Web-based learning activities by a number of learning group
representatives (both male and female). An explanation, provided by one student, was indicative of that expressed by many interviewees:

>You've got more access to information. You can look things up really quickly, log into a different address and find the information that you want. But, in a classroom you haven't got all the facilities there... like, you might have a few books but there's not going to be an answer to everything you want. But, with the Web there always is.

Another student supported this statement,

>Probably more effective because you're actually getting into the retrieval of the information more. And there's more of you going out and looking for information. I learned a fair bit from different sites; just keep on reading.

Interviewees were asked to comment on the individual learning activities. All representatives of the learning groups noted that they liked the variety of the tutorial tasks. Interviewees particularly enjoyed engaging in the 'Crabwell Grommet' activity which required groups to investigate a narrative regarding risk factors for heart disease and develop their own story for HIV/AIDS. Interviewees explained that this activity allowed groups to be creative. A number of interviewees also made positive comments regarding the worksite health promotion program development activity for 'Ron and his colleagues.' Students explained that they liked the "real life situation" of the activity.
Among those who perceived greater effectiveness within the face-to-face learning environment, a theme of interaction with the lecturer prevailed. Even for those students who felt that the Web-based learning environment was more effective than the face-to-face learning environment in terms of facilitating their understanding of the subject, the component missing from the Web-based tutorials was the ability to ask questions and receive feedback from the lecturer "there and then." One student felt,

*I thought the classroom is better in the respect that you get to ask questions and you get feedback from the lecturer - things you're not sure of and stuff and you get to learn a bit more than just what's in front of you.*

Students who participated in the Web-based tutorials in an asynchronous mode felt that one of the strengths of the face-to-face learning environment was the opportunity for immediate response from peers. One student explained,

*The only thing about the Web is you can't discuss it with the person next to you straight away and you can't ask questions if you don't understand. Being in the classroom, you might be more motivated by the people around you.*

Another student referred to the limitation of interaction to group members in the Web-based learning environment,

*With the Web you can really only express your point of view to the people who are linked on with you. Whereas in the classroom, you can express it to everyone. But, then, a lot of people are going to disagree with you anyway. On the Web there was just us five, but in the classroom situation there's more input.*
Another student furthered the issue of multiple perspectives available in the face-to-face situation where a number of students are present,

In the classroom you can get more people's perspective. Because it's just our group on the Web. In the class you can sort of overhear the other groups, what they are talking about, ask other people. Yeah, that's the interaction side of the classroom.

Many of the interviewees felt that they spent more time on the Web-based learning activities. Some students felt this was due to the fact that group members were actively researching the information that supported their responses. As one student said,

More information was gathered using the Web like compared to the classroom because people are just sitting down there for usually a fair while just looking over the questions and looking into it a bit more.

In some cases, the extra time spent on the Web-based tutorials was due to the fact that some groups choose to conduct the activities asynchronously. One student explained,

The classroom tutorials were over in an hour and then we took it home and it was all over and done with. But, with the computer tutorials, we spent a lot more time on the assignment. In our group we went [to the Web] three times to finish it.
For some the extra time was due to the need to type comments into the Discussion Area rather than to speak in the face-to-face environment and write notes. One student said,

*It's quicker in the classroom just because of speed typing. I can type but just not ask quick as I can write. But, at least there's cutting and pasting so it's probably neater on the Web.*

Interviewees were asked to make suggestions to enhance the Web-based tutorials. Most interviewees were happy with the Web-based tutorials and could find little room for improvement. For those groups who experienced process and management problems, hints or strategies for dealing with group learning were requested. Furthermore, some representatives of these groups felt that Web-based tutorials should only be conducted synchronously. Some suggested technical advancements for the Web-based learning environment such as grammar and spell check.

Interviewees were asked about their use of other sections of the Web-based learning environment (i.e., Subject Outline, Schedule, Resources & Web Links, and Notice Board) and to comment on their usefulness. Overwhelmingly interviewees felt that the Notice Board was useful for keeping them up to date on the subject as the session progressed. The fact that the entries on the Notice Board were personalised to the particular students enrolled in the class and contained administrative, academic and social aspects of the class (depicted in text and photos) seemed to be important to the students. One student explained, "I used to go to the Notice Board every time I went on [to the Web site] just to see what was happening and if there was any new goss that was happening with the class." A number of students placed importance on the personalisation of the Notice Board to the class - one student explained this and requested more.
It was interesting and I showed my parents the Web site and I showed them all the photos. Because they kind of try to involve themselves in what I'm doing, even thought I might try to keep it secret. But they like to see who's in my course and without them actually coming down to Uni and doing like a parents day with our class - which is kind of embarrassing. But it's good for them to put a face to a name. Like I'll say 'Shaun did this' and I can show 'ah, this is Shaun'. So that was good. But, maybe if a bit more of the funny things were on the Notice Board.

Many interviewees also felt that annotated links to external Web sites were useful as they engaged in the tutorial activities and worked on the major assignment that was associated with the subject.
Research Question Four:

Research question four focused on the experiments' impact on the computer and Web related skills and attitude toward using the computer for participants. Specifically, the question was:

**What impact does using a Web-based learning environment for health education have on learners' attitude toward using computers?**

The data that addressed this question were in the form of:

- the Computer Attitude Questionnaire (CAQ) administered at the beginning and conclusion of the subject (i.e., pre- and post-intervention of Web-based learning environment);
- triangulation with the in-depth interviews with a randomly selected representative from each learning group (n=7 for E1 and n=7 for E2).

Students increased their computer attitude score pre to poste (see Table 5.29).

However, this increase was not significant.

<table>
<thead>
<tr>
<th>Variable</th>
<th>M</th>
<th>SD</th>
<th>Min.</th>
<th>Max</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test</td>
<td>81.32</td>
<td>13.96</td>
<td>41</td>
<td>105</td>
<td>57</td>
</tr>
<tr>
<td>Post-test</td>
<td>88.16</td>
<td>12.83</td>
<td>52</td>
<td>114</td>
<td>57</td>
</tr>
</tbody>
</table>

Note. \( t=-5.61 \), \( p>.05 \)

During the in-depth interviews, representatives of the learning groups were asked if engaging in the Web-based tutorials had an impact on their computer/Web skill or
comfort level. For those who participated in on-line tutorials during experiment 1, four of the seven interviewees responded that using the Web-based learning environment helped to increase their skills in using computers in general, and the World Wide Web specifically. Three of the seven interviewees felt that they possessed a high level of skills prior to engaging in the subject. For those who participated in on-line tutorials during experiment 2, five of the seven interviewees felt that their computer and Web skills increased as a result of using the Web-based learning environment. For most of these students, use of the subject Web site allowed them to improve on a basic level of skill in using computers and the Web. However, for some students, the increase in skills was exponential. One student explained, "It has improved heaps. I didn't even know how to turn a computer on [before using the subject Web site]. It's been a big help."

Most importantly, seven of the nine interviewees who felt their computer and Web-related skills had increased due to engaging in the Web-based learning environment also felt that they had gained more comfort in using this technology. One of the students expressed their increased confidence regarding using computers in this way,

I was a bit nervous, I mean, I know computers are going to be important so I've wanted to do it. But, I haven't had the confidence. Actually using them for something constructive, I've got the confidence now. A big positive.
Another student referred to their increased comfort in using the Internet,

*I'd never been on the Internet til this course. So, I was really pleased about it because I was a bit daunted by the whole process of Internet and I'm not now. So, that was a big learning curve for me.*

Thus, the use of the Web-based learning environment had some effect in fostering a more positive attitude toward using computers among this group of students.
Summary of Results

A summary of the results of phase two of the study is presented by research question in Table 5.30.

Table 5.30: Summary of results.

<table>
<thead>
<tr>
<th>Research Question</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>What was the effectiveness of the use of a Web-based learning environment in delivering health education relative to that of the traditional face-to-face environment in terms of knowledge, attitude and behaviour change?</td>
<td>The Web-based learning environment was as effective as the face-to-face environment for facilitating health-related knowledge, attitude and behaviour change. Descriptive indices point in the direction of the Web-based learning environment in terms of effectiveness.</td>
</tr>
<tr>
<td>How did learners participate in and contribute to collaborative health education learning activities within Web-based and face-to-face learning environments?</td>
<td>Learners tend to provide more inputs to collaborative activities within face-to-face environments. However, contributions within the Web-based learning environment tend to be more detailed. Learners tend to refer to sources when providing contributions in the Web-based tutorials.</td>
</tr>
<tr>
<td>What were learners' perceptions of the effectiveness of Web-based learning environments for health education?</td>
<td>Learners perceived the Web-based learning environment to be more effective or as effective as face-to-face tutorials in facilitating their understanding of the health education concepts covered in the learning activities. They appreciated the flexibility, opportunity for independent inquiry and reflection offered by the Web-based learning environment. However, learners felt that the interaction with both lecturer and a larger number of peers was an integral aspect of the face-to-face tutorials.</td>
</tr>
<tr>
<td>What impact did using a Web-based learning environment for health education have on learners' attitude toward using computers?</td>
<td>Using the Web-based learning environment facilitated a more positive attitude toward using computers for learners.</td>
</tr>
</tbody>
</table>
Chapter 6: Conclusions, Discussion and Recommendations

This study evaluated the efficacy of using a Web-based learning environment in the delivery of an undergraduate health education subject in a higher education setting. To this end, the study re-examined the pedagogical strategy of didactic tutorials traditionally implemented and sought to explore how collaborative learning activities could be conducted within a Web-base learning environment. In doing so, the study not only looked at the potential outcomes related to a Web-based learning environment, but it allowed for a comparison with face-to-face delivery by utilising collaborative learning activities in both environments.

To ensure pedagogical soundness of the collaborative tutorial activities and the educational and technical strength of the Web-based learning environment a formative evaluation was conducted as a major feature of the study.

The study also investigated the learning interactions and measured the learning outcomes (specifically knowledge construction and attitude and behaviour change) for learners who engaged in collaborative activities focused on HIV/AIDS and nutrition within the Web-based and traditional face-to-face learning environments as implemented in the particular health education subject.
The research questions were:

- How effective is the use of a Web-based learning environment in delivering health education relative to that of the traditional face-to-face environment in terms of knowledge, attitude and behaviour change?

- How do learners participate in and contribute to collaborative health education learning activities within Web-based and face-to-face learning environments?

- What are learners' perceptions of the effectiveness of Web-based learning environments for health education?

- What impact does using a Web-based learning environment for health education have on learners' attitude toward using computers?
Conclusions

Based on the analysis of the data associated with phase two of the investigation the following conclusions were derived:

- Statistically significant improvements across the domains of knowledge, attitude and behaviour change suggested task-based collaborative learning activities were an effective pedagogical strategy for topics related to health education.
- Both Web-based and face-to-face learning environments facilitated health-related knowledge construction and attitude and behaviour change.
- When comparing face-to-face and Web-based learning environments that support collaborative tutorial activities, one environment did not prove to be constantly and significantly more effective than the other in terms of facilitating knowledge construction and attitude and behaviour change related to health education. However, descriptive indices suggested Web-based environments may be more effective.
- Results associated with attitude and behaviour domains must be considered in light of the life stage of the study population. Changes in attitude and behaviour associated with HIV/AIDS and nutrition may be related more to changes in sexual practices and eating behaviour which were associated with the age and lifestyle changes of first year undergraduate students rather than the health education intervention specifically.
- Learners' perceived the Web-based learning environment to be as effective or more effective than face-to-face environments for supporting collaborative, health education, tutorial activities.
- Learners' perception of the effectiveness of Web-based learning environment was validated by measured outcomes related to knowledge construction and attitude and behaviour change related to health education.
- Learners contributed fewer individual inputs to groups discussions related to the collaborative tutorial activities within the Web-based learning environment as
opposed to similar face-to-face situations. However, learners' individual contributions within Web-based discussion spaces were far more detailed than those that were provided when learners engaged in the face-to-face.

- The nature of learning group collaborations differed in face-to-face and Web-based learning environments:
  - Learners tended to elaborate on ideas and challenged their group members with requests for clarification in collaborative tutorial activities within the face-to-face more so than Web-based learning environments.
  - Learners tended to refer to sources (whether personal experience, subject material or external resources) in collaborative tutorial activities within the Web-based more so than face-to-face learning environments.

- The Web-based learning environment provided non-confronting learning experiences for learners as evidenced by their tendency to contribute more references to personal experiences in Web-based tutorials than in face-to-face tutorials.

- Learners overcame obstacles of reduced visual cues within the Web-based learning environment and tended to contribute more socio-affective comments toward their learning group members within Web-based tutorials than in face-to-face situations.

- Learners' use of Web-based learning environments facilitated the development of positive attitudes toward the use of computers.
Discussion and Recommendations

The importance of this study lay in its testing of the efficacy of the use of Web-based learning environments in delivering health education.

The findings of the study provided an understanding of how knowledge construction and attitude and behaviour change related to health education have the potential to be facilitated in a Web-based learning environment. In terms of measured learning outcomes, the Web-based learning environment proved to be effective in supporting collaborative tutorial activities for health education topics considered. Furthermore, learners perceived the Web-based environment to be as effective or more effective in facilitating their understanding of the health education topics covered in the subject. This added to a developing body of literature that provides some indication that institutions of higher education can continue on the path of Web-based flexible delivery with some degree of confidence. Additionally, the nature of the learning collaborations that occurred in the learning environments and the learners' responses to their experience highlighted interesting issues to be considered which are discussed below. Consideration of the results and conclusions drawn from this study led to the development of a number of recommendations for the design and implementation of Web-based learning in the higher education setting.

Design of Learning Activities

Descriptive indices related to the knowledge, attitude and behaviour domains provided support for the use of the task-based collaborative learning activities for health education. Furthermore, learners responded positively to the activities and
particularly enjoyed those tasks that facilitated group creativity or allowed the group to explore health education within a "real life" context (i.e., in secondary school or work-site situations).

The time and consideration taken in the selection of pedagogical strategy and the design and development of the individual learning activities prior to the design and development of the prototype Web-based and face-to-face learning environments proved to be invaluable. As also found by Oliver and Omari (1999), much of the challenge in the development of task-based activities was in creating a problem that was open-ended enough to facilitate both collaboration and creative problem solving but not enough such that learners deviated far from the intended learning experience and outcomes. Additionally, a key element in the design of the activities was the particular context of the subject and the future roles of the learners engaged in the subject (i.e, health education) and the application of the related concepts by future health education professionals.

This experience supported concepts recently expressed in educational technology-related literature which place emphasis on the pedagogical design and selection of learning tasks in the development of Web-based learning environments (Alexander, 1995; Fetherston, 1999; Oliver & Omari, 1999).

**Recommendation:** Instructional designers should consider the selection of appropriate pedagogical strategies and design of learning activities as essential components in the development of effective Web-based learning environments.
As has traditionally been the case in face-to-face delivery, the selection of pedagogical strategies and the design of learning tasks are vital components in facilitating learning outcomes. These issues must be considered as they are related to the particular learning context and should be addressed before a Web-based learning environment can be designed and constructed.

**Evaluation of Learning Activities and Environments**

Importantly, the undertaking of the formative evaluation of the learning activities and learning environments prior to implementation during subject delivery was most beneficial for refining the conceptual and practical structure of the activities and the Web site. The outcomes of this process supported the emerging argument in the literature for evaluations of educational innovations that are derived from a learning-centred paradigm (Alexander & Hedberg, 1994; Bain, 1999).

**Recommendation:** Formative evaluation of learning activities and learning environments prior to implementation (or re-implementation) should be undertaken where possible.

**Collaborative Group Learning**

While group learning methods have been argued for and proven to be effective (Slavin, 1989), participants in this research study perceived difficulties in working on collaborative activities. Groups which experienced consistent cohesion in terms of motivation and participation among group members reported positive learning
experiences regardless of the learning environment. Similarly, those who experienced group process difficulties reported that these difficulties arose in both face-to-face and Web-based learning environments.

Those who reported experiencing difficulty in managing the group process pointed to a range of issues and such issues were consistent with those defined in the literature pertaining to computer-mediated an/or and on-line learning (Agostinho, Lefoe, & Hedberg, 1997; Oliver, Omari, & Herrington, 1997; Ruberg, Taylor, & Moore, 1996).

Many learners reported the perception that more equality of participation was experienced in the Web-based learning environment. Yet, among the noted difficulties with group process, regardless of learning environment, was what Valacich, Dennis, and Nunamaker, Jr. (1992) referred to as 'free riding' where learners were frustrated with some group members' lack of participation and tendency to rely on and assume that other members would complete the task. It was interesting to note that some of the learners who participated in the in-depth interviews admitted to engaging in 'free riding' themselves in both Web-based and face-to-face situations.

**Recommendation:** Learners' should be supported in developing group management and process skills when collaborative strategies are employed within both face-to-face and Web-based learning environments.

Learners need to develop strategies to cope with the specific issues related to group learning methods (e.g. time management, leadership, equity in participation). This is true of both face-to-face and Web-based learning contexts.
Learners' Perceptions of Web-based Learning

Participants in this research investigation reported positive perceptions of Web-based learning. This finding was in keeping with the growing body of literature which evaluates on-line learning from a learner-centred paradigm (Gunn, 1999; Oliver & Omari, 1999).

Flexibility of Web-based Learning Environments

While the pedagogical implications and learning outcomes were the focus in this study, learners' emphasis on the convenience and flexibility of Web-based learning environments should not be disregarded. This is an important consideration given the competing demands and priorities of university students who expect and require flexible delivery to fit in with their lifestyle (Gosper et al, 1996). However, use of such technology created a further issue for the development of skills associated with 'competent studentship' where the skills associated with carrying out one's role as a student in the higher education setting have become dynamic (Winiecki, 1999). Frustration reported by students in this and other studies (e.g., Schutte, 1997) included unfamiliarity with computers, the Web and the particular Web-based learning environment. It has been argued that "... the quality and quantity of meaningful collaboration often depends upon the tools used to create it" (Schrage, 1995, p. 27). While Web-based tools can be designed and structured to support collaboration (e.g., as Discussion Area and Submit Page in the context of the learning environment associated with this study) learners need to develop some skill level in using the tools effectively. Thus, higher education institutions which are transforming learning experiences to the on-line setting must support students in 'learning how to learn' in these new environments.
Recommendation: Learners should be supported in the development of studentship skills that are specific to engaging in technology-supported learning environments.

Learner-directed Inquiry and Reflection

Learners' perceived pedagogical effectiveness of the Web-based environment was related to the opportunity to research information using print and electronic resources and reflect on their own ideas and the contributions of their work group peers. This supported the literature (Laurillard, 1993; Romiszowski & Mason, 1996) on the pedagogical benefits of reflection and self-direction afforded by asynchronous learning environments. However, it was interesting to observe that while learners reported the use of subject materials and external resources for developing individual ideas and group consensus related to the tutorial activities during in-depth interviews, explicit references to such sources were not always reflected in the contributions made within the Web-based Discussion Area. Due to the real-world setting of this research investigation, the contributions collected within the Web-based Discussion Area or recorded on the audio tape of the face-to-face meetings may have been only a sub-set of the actual collaborations/effort on the part of learners in the tutorial activities. However, the findings suggest that learners may require support in developing skills related to argument development and evidence-based referencing particularly as learners' access to Web-based resource materials increases.
Nature of Collaborations

The analysis of the learning group collaborations and the feedback from learners demonstrate that some differences do exist in the nature of the collaborations that are experienced in the Web-based and face-to-face learning environments.

Type of Participation

The resulting collaboration within the Web-based learning environment was similar to other reported findings of computer-mediated communications or on-line learning experiences. Learners reported an equality of participation among group members in the Web-based environment which is consistent with CMC-related literature (Alexander, 1995; Harasim, 1993; Romiszowski & Mason, 1996; Sproull & Kiesler, 1993).

Additionally, learning groups in the Web-based environment initiated more individual ideas related to the learning task than face-to-face groups. Yet, unlike the face-to-face groups, those in the Web-based setting rarely elaborated or challenged those initial ideas prior to reaching a final group decision. In many cases, the Web-based group summarised the ideas of the individual members into a final group response. This is similar to the findings of Sproull and Kiesler (1993) that groups working in CMC environments put forward more proposals for action and took longer to research decisions than groups engaged in face-to-face environments.
Recommendation: Developing structure around the group process and task may facilitate the development of shared group decision-making.

Personalised Learning Environments

Analysis of the collaborations within the Web-based and face-to-face learning environments indicate that learners felt comfortable expressing personal opinions and experiences related to issues such as sexual practices, interactions with HIV-infected persons, and body image. Furthermore, within the Web-based learning environment, learners expressed socio-affective comments toward peers. This supported the findings of other studies that on-line or Web-based environments can provide for non-confronting personal experiences in which learner interaction is dynamic regardless of the reduced visual cues (Rheingold, 1994; Romiszowski & Mason, 1996; Sproull & Kiesler, 1993). This is an important aspect of the pedagogy related to health education in general and to the training of health education professionals specifically.

Recommendation: Web-based environments should be considered for the facilitation of non-confronting, personalised learning contexts particularly for disciplines such as health education where expression of attitudes and values is a key component of the learning experience.
Contact with Lecturer

A key factor in learners' perceptions of the effectiveness of the face-to-face learning environment was contact with the lecturer. Learners felt that they were afforded more access to the lecturer in the face-to-face tutorials and that this was an important factor in facilitating their understanding of the topics covered within the health education subject. Similar results were found by other researchers (such as Oliver & Omari, 1999 and Schutte, 1997) in their studies of the use of on-line learning environments in the higher education setting. In these investigations, students reported that learners valued the input of the teacher and the face-to-face component of classes as an important part of the learning experience (Oliver & Omari, 1999 and Schutte, 1997). Furthermore, learners expressed frustrations in using Web-based learning environments when they were unable to ask questions of the professor (Schutte, 1997).

Recommendation: Web-based learning environments should ensure adequate involvement of and access to the lecturer.

Clarification of the role that the lecturer plays in the delivery of Web-based learning is vital. Learners place value on regular contact with the lecturer to facilitate understanding of subject-related issues and clarify the parameters of learning tasks. In situations where Web-based learning activities complement face-to-face delivery (as was the case in this study) it is recommended that learners are provided with some degree of on-line access to the lecturer.
Attitude Toward Using Computers

The results of the investigation are in keeping with the findings reported in the literature in terms of the impact of participation in on-line and Web-based learning environments in fostering positive attitudes among students regarding computer use (Ruberg, Taylor & Moore, 1996a; Kushner, 1997). This supports the concept of the integration of technology-based learning environments throughout course curriculum in an effort to increase students' skill in using and attitude toward computers and the Web within the context of their discipline of study (Ministerial Advisory Council on the Quality of Teaching, 1998; Dockstader, 1999).

Further Research

This study also highlighted the need for further research in a number of areas:

- Web-based learning environments' capacity to sustain continued positive learning outcomes when implemented over a longer time frame.
- The effectiveness of Web-based learning environments in facilitating collaborative activities for other topics within health education.
- The effectiveness of Web-based learning environments in facilitating health education for other populations.
- The advantages or disadvantages of asynchronous and synchronous learning collaborations particular to health education learning activities.

This study was undertaken to investigate the effectiveness of Web-based learning environments in facilitating health-related knowledge construction and attitude and behaviour change. The experience from the learners' perspective and the measured learning outcomes supported the use of the Web in facilitating health education...
learning experiences within the higher education context. Further research in the above-mentioned areas will provide additional indications of use and effectiveness.
Bibliography


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EDUP144: Health and Health Behaviour
Subject Outline & Schedule

Lecturer: Professor John Patterson
Office: 67.342
Telephone: 02 4221 3961

Office Hours: Mondays 4.00-5.00pm

Rationale
This subject is the precursor for a sequence of courses which examine the major issues inherent in health and society. The nature of disease/disease processes will be clarified and the major risk factors associated with morbidity and mortality will be addressed. The role of lifestyle factors in the disease process, and in health promotion, will be examined. The subject culminates with an exploration of nutrition as a dimension of total health.

Objectives
Students who have satisfactorily completed this subject will have:
• discussed aspects of behaviour modification and personal choice pertaining to health issues;
• described contemporary theories of disease and recognised the concepts involved in describing the disease process;
• identified the major risk factors and described, in detail, selected major diseases associated with morbidity and mortality in Australian society;
• briefly discussed the role of nutrition in the disease process and in health promotion; and,
• identified food nutrients, their functions and primary purpose.

Content
Content covered in the subject will include:
• Health and personal choice. Health behaviour models.
• Disease processes: homeostasis and homogenises; chronic and acute; infectious and communicable; degenerative. Classification of disease.
• Risk factors: genetic, lifestyle and environmental factors.
• Major causes of morbidity and mortality: cardiovascular disease; neoplasia.
• Nutrition as a risk factor.
• Communicable and infectious diseases.
• Nutrition concepts: dietary guidelines, food composition, functions and sources of food, balanced diet.
• Personal choice, diet, and health promotion.
Presentation

The course requires three contact hours per week and these will be utilised as two hours lecture and one hour tutorial.

For the tutorials, the class will be divided into 4 tutorial groups with each group required to participate in the equivalent of a one hour tutorial per week. Each tutorial group will be required to participate in three weeks of on-line tutorials using the subject Web site.

Lecture, seminar, and discussion format will be used to present subject material.

Location

Lectures  Tuesdays 8.35 - 10.30am
Building 67 ~ Room 101

Tutorials  Tuesdays  1.35-2.30 or 2.35-3.30 (as assigned)
Building 67 ~ Room 303B & Building 17 ~ Room 104, Endor Lab

Text


Web Site

A Web site has been constructed for this subject which includes the subject outline, subject schedule, subject resources and Web links, and, most importantly, supports the tutorial activities that will be conducted on-line. The Web site can be found at the following address:


To access the tutorials Activity Centre area of the site students will require an individual user name and password. Names and passwords will be distributed to each student during tutorials in the week prior to commencement of the on-line activities.

Additional information about the Web site will be provided in lectures/tutorials and on a Help Sheet distributed under separate cover.

Attendance

To satisfy subject requirements students must complete 80% of tutorials. Inability to comply with these rules will result in failure.
Assessment

The subject components will be assessed as follows:

**Examination 1 ~ 30%**
This will be in the form of multiple choice questions and held during lectures in week 8.

**Examination 2 ~ 30%**
This will be in the form of multiple choice questions and held during the exam period at the end of session.

**Pop Quizzes ~ 10 %**
These will be held randomly during the lecture series. There will be a minimum of two and a maximum of three during each seven week period. They will be given during the first 15 minutes of a lecture. Examination rules regarding cheating and attendance will apply.

**Tutorial Tasks ~ 10%**
These will be provided during tutorials and must be completed prior to the next tutorial. They will be marked on a Pass/Fail basis. Tutorial assessment tasks will be handed in during the tutorial or no later than 12pm on the Monday prior to the next tutorial.

**Assignment ~ 20%**
Topics for the assignment will be provided under separate cover during week 2 of lectures. The assignment is **due Friday, 18 September, 1998.** If the answer is in full essay form, it is to be no more than 1500 words in length. Other ways of answering may be negotiated. All answers are to demonstrate reading beyond the text and be fully referenced.

*To satisfy subject requirements students must pass every section of the assessment. There will be no exceptions.*
<table>
<thead>
<tr>
<th>Week &amp; Date</th>
<th>Lecture</th>
<th>Tutorial</th>
<th>Text Chapter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 21 July</td>
<td>Subject Introduction. Nature of Health.</td>
<td>Factors Affecting Health.</td>
<td>1</td>
</tr>
<tr>
<td>2 28 July</td>
<td>Health and Disease Epidemiology.</td>
<td>Epidemiology of Heart Disease and Cancer.</td>
<td>17 18</td>
</tr>
<tr>
<td>3 4 Aug</td>
<td>Nature of Disease, Terminology. Classification. Chronic and Degenerative Diseases.</td>
<td>Chronic and Degenerative Diseases.</td>
<td>20</td>
</tr>
<tr>
<td>4 11 Aug</td>
<td>Communicable Diseases.</td>
<td>Modes of Transmission.</td>
<td>19</td>
</tr>
<tr>
<td>5 15 Aug</td>
<td>Sexually Transmitted Diseases: HIV/AIDS.</td>
<td>Risk Factors.</td>
<td>19</td>
</tr>
<tr>
<td>7 1 Sept</td>
<td>Health and Personal Choice. Health Behaviour Models.</td>
<td>Behaviour Exploration 1.</td>
<td>1</td>
</tr>
<tr>
<td>8 8 Sept</td>
<td>Examination 1</td>
<td></td>
<td>2 (to page 47)</td>
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<tr>
<td>9 15 Sept</td>
<td>Health Behaviour Models.</td>
<td>Behaviour Exploration 2.</td>
<td>1</td>
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<tr>
<td>10 22 Sept</td>
<td>Nutritional Concepts.</td>
<td>Food Facts.</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>Recess ~ 28 September through 9 October</td>
<td></td>
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<tr>
<td>11 13 Oct</td>
<td>Energy and Weight Control.</td>
<td>Food Choices.</td>
<td>10</td>
</tr>
<tr>
<td>12 20 Oct</td>
<td>Nutrition and Eating Disorders in Adolescence.</td>
<td>Body Image.</td>
<td>10</td>
</tr>
<tr>
<td>13 27 Oct</td>
<td>Diet and Heart Disease, Diabetes, Allergies, Cancer, Trauma.</td>
<td>Diet Disease and Aetiology.</td>
<td>related pages of chapters: 9, 10, 17, 18</td>
</tr>
<tr>
<td>14 3 Nov</td>
<td>Sport Specific Diets (e.g., strength, endurance).</td>
<td>Eating is a Marathon Event.</td>
<td></td>
</tr>
</tbody>
</table>
# Schedule - REVISED AS OF WEEK FIVE

<table>
<thead>
<tr>
<th>Week &amp; Date</th>
<th>Lecture</th>
<th>Tutorial</th>
<th>Text Chapter(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 21 July</td>
<td>Subject Introduction. Nature of Health.</td>
<td>Factors Affecting Health.</td>
<td>1</td>
</tr>
<tr>
<td>2 28 July</td>
<td>Health and Disease Epidemiology.</td>
<td>Epidemiology of Heart Disease and Cancer.</td>
<td>17 18</td>
</tr>
<tr>
<td>3 4 Aug</td>
<td>Nature of Disease, Terminology, Classification. Chronic and Degenerative Diseases.</td>
<td>Chronic and Degenerative Diseases.</td>
<td>20</td>
</tr>
<tr>
<td>4 11 Aug</td>
<td>Communicable Diseases.</td>
<td>Modes of Transmission.</td>
<td>19</td>
</tr>
<tr>
<td>5 18 Aug</td>
<td>Lectures and Tutorials Cancelled Due to Natural Disaster!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 25 Aug</td>
<td>Sexually Transmitted Diseases: HIV/AIDS.</td>
<td>Risk Factors.</td>
<td>19</td>
</tr>
<tr>
<td>7 1 Sept</td>
<td>Maintaining Health. Immunity and Risk Factors.</td>
<td>Behaviours and Behaviour Change</td>
<td>2 (to page 47) 3 19 (480-483)</td>
</tr>
<tr>
<td>9 15 Sept</td>
<td>Examination 1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 22 Sept</td>
<td>Health Behaviour Models.</td>
<td>Behaviour Exploration 2.</td>
<td>1 2 (to page 47)</td>
</tr>
<tr>
<td>11 13 Oct</td>
<td>Nutritional Concepts related to Health and Disease</td>
<td>Food Facts.</td>
<td>9</td>
</tr>
<tr>
<td>12 20 Oct</td>
<td>Energy and Weight Control.</td>
<td>Food Choices.</td>
<td>10</td>
</tr>
<tr>
<td>13 27 Oct</td>
<td>Nutrition and Eating Disorders in Adolescence.</td>
<td>Body Image.</td>
<td>10</td>
</tr>
<tr>
<td>14 3 Nov</td>
<td>Sport Specific Diets (e.g., strength, endurance).</td>
<td>Eating is a Marathon Event.</td>
<td></td>
</tr>
</tbody>
</table>

NB: The topic: Diet and Heart Disease, Diabetes, Allergies, Cancer, Trauma, originally scheduled for Week 13, will now be covered throughout the Nutrition lectures and tutorials during the second half of session. As such, students should ensure they have covered the related pages of chapters 9, 10, 17 and 18 in their readings.
Appendix B: Formative Evaluation Expert Review Panel

Ms. Yvonne Kerr  
Sub-Dean and Senior Lecturer in Physical and Health Education  
Faculty of Education, University of Wollongong

Ms. Roslyn Westbrook  
Lecturer in Physical and Health Education,  
Faculty of Education, University of Wollongong

Dr. Tonia Gray  
Senior Lecturer in Physical and Health Education,  
Faculty of Education, University of Wollongong

Ms. Meg Pickup  
Lecturer in Health Education  
Faculty of Education, University of Sydney

Dr. John Hedberg  
Professor of Information Technology in Education  
Co-Director, Interactive Multimedia Learning Laboratory  
Faculty of Education, University of Wollongong

Dr. Barry Harper  
Associate Professor of Information Technology in Education  
Co-Director, Interactive Multimedia Learning Laboratory  
Faculty of Education, University of Wollongong

Dr. Christine Brown  
Lecturer in Information Technology in Education  
Faculty of Education, University of Wollongong

Mr. John Larkin  
Instructional Designer and Project Manager,  
Interactive Multimedia Learning Laboratory,  
Faculty of Education, University of Wollongong

Ms. Shirley Agosthino  
Instructional Designer and Research Associate,  
Interactive Multimedia Learning Laboratory,  
Faculty of Education, University of Wollongong

Mr. Mark McMahon  
Instructional Designer and Lecturer in Information Technology in Education  
Edith Cowan University
Appendix C: Letter to Expert Reviewers

Name
Department
Institution
Address

Dear Name,

Thank you for agreeing to review the Web site constructed for the EDUP144 Health and Health Behaviour subject. Your feedback will be a great help in reviewing and revising the Web site before it is implemented in the class. Here's a bit of background information about my research and the prototype Web site to give you some context:

My Research
The World Wide Web is increasingly being used to deliver education at the tertiary level. And while the literature suggests that the Web provides for a number of learning experiences that go beyond that possible in the traditional classroom environment, our understanding of the efficacy of the Web, in terms of its facilitation of learning outcomes and attitude change, remains limited.

My research is focused on exploring how the Web can be used to deliver health education. Specifically, I am interested in how Web communication tools can be used to facilitate discussion among learners. Additionally, I am interested in measuring the learning outcomes and attitude change that are associated with such discourse-based learning activities.

The Subject & The Students
EDUP144, Health and Health Behaviour, is a core subject for undergraduates enrolled in the Faculty of Education's Bachelor of Education in Physical and Health Education program. This subject is to be completed by the students in their first year of the program as it is a precursor for a sequence of subjects, which examine major health issues.

The Web Site & Review
The purpose of the Web site is to provide information about the subject, EDUP144 in general, but more specifically, to describe and facilitate the on-line tutorial activities that will be used in the subject this year.
The Web site can be accessed at the following address:


**For the login procedure in the Activity Centre, "Name" is fsurname (no capitals), and "Password" is fsurname (no capitals).

Please explore the site, read the information provided, follow the external links and have a go at the tutorial activities (i.e., respond to the questionnaires, enter comments in the discussion areas). I'm interested in your impression on all aspects of the site.

On the attached form, I have listed a number of questions that I would like you to consider when reviewing the site. Once you've reviewed the site, I'd like to meet with you to get your comments. I'll contact you to set up a time for us to meet.

If you run into any difficulty while reviewing the site, have any questions or would like to discuss the review, please do not hesitate to contact me:

Uni phone: (02) 4221 5738
Home phone: (02) 4228 5529
Email: lori_lockyer@uow.edu.au

As the Web site must be revised based on the feedback provided by you and other content and instructional technology experts before next session, I would appreciate it if I could meet with you to discuss your impressions of the site by Friday, 29 May,

Name, thanks again for your help. I'm looking forward to your comments.

Sincerely,

Lori Lockyer

Enclosure
(1) **Reviewer Details**  
~ First I'd appreciate some information about you:

<table>
<thead>
<tr>
<th>Field</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Name</td>
<td></td>
</tr>
<tr>
<td>Surname</td>
<td></td>
</tr>
<tr>
<td>Position</td>
<td></td>
</tr>
<tr>
<td>Organisation</td>
<td></td>
</tr>
<tr>
<td>Address</td>
<td></td>
</tr>
<tr>
<td>Telephone</td>
<td></td>
</tr>
<tr>
<td>Fax</td>
<td></td>
</tr>
<tr>
<td>E-mail</td>
<td></td>
</tr>
</tbody>
</table>

Please provide a brief description of your experience in instructional technology and/or health education.

Computer type used to access the Web site:

- [ ] Mac  
- [ ] PC  
- [ ] Not Sure

Web browser used to access the Web site:

- [ ] Netscape, Version [ ]
- [ ] Explorer, Version [ ]
- [ ] Not Sure

(2) **Site Structure and Navigation**

2.1 Was the structure of the site clearly recognisable throughout?  
- [ ] Yes  
- [ ] No  

~ If not, please explain what was unclear about the structure
2.2 Is the text easy to read in terms of font and size?  Yes  No
~ Are there specific pages that are difficult to read? Which ones? What did you find problematic?

2.3 Is the site aesthetically attractive?  Yes  No
~ Are there specific aspects about the site that you found appealing? unappealing?

2.4 Were you able to move to different areas of the Web site without difficulty?  Yes  No
~ Did you encounter any specific problems when navigating around the site?
2.5 Were the navigational graphics/icons clearly identifiable and appropriate?  
_Yes _No  
~ If not, please explain what was not clear/appropriate.

(3) **Quality and Depth of Content**

3.1 Was the information clear and easy to read?  _Yes _No  
~ If not, please note the areas you found unclear and what was problematic about the information.

3.2 Given the topics covered in this subject, are the links to external Web sites appropriate?  _Yes _No  
~ Are you aware of any other external sites that might be appropriate for this subject?  
~ Are there topics that are not appropriately covered by the external Web links?
### Learning Activities

Please provide your comments on each of the learning activities contained in the Web site.

<table>
<thead>
<tr>
<th>Learning Activity</th>
<th>Is the learning activity clearly described? If not, what do you see as a potential problem for the students in understanding the task?</th>
<th>Do you feel the learning activity will: (1) motivate the students; and (2) promote discussion among students.</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 - Modes of Transmission</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 - Risk Factors</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 - Learning &amp; Logic</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 - Food Facts</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 - Food Choices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 - Body Image</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
(5) **Other Comments**

I would appreciate any other comments or suggestions you may have regarding the Web site.

Thank you for taking the time to provide feedback on the Web site.
Appendix E: Letter to Postgraduate Student Reviewers

Dear Reviewer:

First, let me thank you for reviewing the Web site constructed for the Faculty of Education's EDUP144 Health and Health Behaviour subject. Your feedback will be a great help in reviewing and revising the Web site before it is implemented in the class. Here's a bit of background information about my research, the site, the subject and the students to give you some context:

My Research
The World Wide Web is increasingly being used to deliver education at the tertiary level. And while the literature suggests that the Web provides for a number of learning experiences that go beyond that possible in the traditional classroom environment, our understanding of the efficacy of the Web, in terms of its facilitation of learning outcomes and attitude change, remains limited. My research is focused on exploring how the Web can be used to deliver health education. Specifically, I am interested in how Web communication tools can be used to facilitate discussion among learners. Additionally, I am interested in measuring the learning outcomes and attitude change that are associated with such discourse-based learning activities.

The Subject & The Students
EDUP144, Health and Health Behaviour, is a core subject for undergraduates enrolled in the Faculty of Education's Bachelor of Education in Physical and Health Education program -- a pre-service teaching degree. This subject is to be completed by the students in their first year of the program as it is a precursor for a sequence of subjects which examine major health issues.

The Web Site & Review
The purpose of the Web site is to provide information about the subject, EDUP144 in general, but more specifically, to describe and facilitate the on-line tutorial activities. The Web site can be accessed at the following address:


**For the login procedure in the Activity Centre, "Name" is your first name (no capitals), and "Password" is your surname (no capitals).

On the attached form, I have listed a number of questions that I would like you to consider when reviewing the site. Please respond to the questions in the space provided. And, please feel free to provide any additional feedback on the site. If you run into any difficulty while reviewing the site, have any questions or would like to discuss the review, please do not hesitate to contact me:

Uni phone: (02) 4221 5738
E-mail: lori_lockyer@uow.edu.au

Thanks again for your help!
Appendix F: Formative Evaluation Participant Consent Form

UNIVERSITY OF WOLLONGONG

Consent Form ~ Web Site Review

Researcher: Lori Lockyer

Title:
Delivering Health Education Via the World Wide Web: An Investigation of
Knowledge Construction and Attitude Change Within Discourse-Based Instructional
Strategies

I, ........................................................................................................... consent to participate as a
reviewer of the prototype World Wide Web pages designed for the research
conducted by Lori Lockyer as it has been described to me in the information sheet. I
understand that my feedback will be used to revise the prototype Web pages and
information and activities included in those pages and I consent for my feedback to be
used in that manner.

I consent to be contacted for purposes of the review at the following:

Email: ............................................................................................

Telephone: ..................................................................................

Signed ___________________________ Date __________/______/_____
Surfing Contest

We're looking for help to test the Web site that has been created to be used in the first year subject EDUP144 Health and Health Behaviour.

The Web site includes subject information and activities that will be used for some of the tutorials in the subject.

You can find the Web site at this address:


You can access the site from anywhere you'd normally access the Web (the Link Building, home, etc.). There's also some scheduled time in the multimedia lab in building 22, room 107 between 1pm and 4pm on Thursday 21st May and Monday 25th May. You can access it from there and someone will be there during those times if you need some help.

For the Activity Centre area of the site you need a name and password. For you,

Name:
Password:

This is all the information you should need to have a go, surf around the site, follow the links, read the information, go through activities, answer the questionnaires for the activities, make comments in the discussion areas, etc. Once you've done that, please answer the questions on the other side of this page.

Wait, there's more:

• On the completion of the login you will go into a draw for a MacValue meal of your choice.
• On the completion and handing in of this sheet you will go into a draw for breakfast for two at Maccas.
• The sheet is to be handed back to Patto (67.341) by Friday 29 May.

Please Turn Over
Your name: ________________________________

What year of Uni are you in? ______________________

Did you have any problems getting in to the site or using your password?
   □ Yes □ No  If yes, what didn’t work?
   __________________________________________

Were you able to move through (surf around) the site easily?
   □ Yes □ No  If no, what kind of problems did you run into?
   __________________________________________

Did you like the design and layout of the pages?
   □ Yes □ No  If no, what didn’t you like about it?
   __________________________________________

Did you like the graphics/pictures used on the pages?
   □ Yes □ No  If no, what didn’t you like about them?
   __________________________________________

Was the information in the pages clear/easy to read?
   □ Yes □ No  If no, what wasn’t clear/easy to read?
   __________________________________________

Did you run into any problems when filling out the activity questionnaires or making a comment in the discussion areas?
   □ Yes □ No  If yes, what problems occurred?
   __________________________________________
Activity ~Week 5
Modes of Transmission

Things To Do this week:
- Each member of your group should respond to the HIV/AIDS transmission questions listed below.
- Once you've provided your individual response, enter the discussion area and explain/defend/argue your choice for each situation.
- Come up with a group consensus for each and explain each of your responses.

Which of these situations can transmit HIV?

<table>
<thead>
<tr>
<th>Situation</th>
<th>YES</th>
<th>NO</th>
<th>NOT SURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having a blood transfusion in Australia?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Being cried on by a person with HIV?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hugging and kissing a person with HIV?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Treading on a needle with HIV-infected blood in it?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity</td>
<td>Yes</td>
<td>No</td>
<td>Not Sure</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>----------</td>
</tr>
<tr>
<td>Sharing plates and cutlery with someone with HIV?</td>
<td>Yes</td>
<td>No</td>
<td>Not Sure</td>
</tr>
<tr>
<td>Having penetrative sex without a condom?</td>
<td>Yes</td>
<td>No</td>
<td>Not Sure</td>
</tr>
<tr>
<td>Sitting on a toilet seat after a person with HIV has sat there?</td>
<td>Yes</td>
<td>No</td>
<td>Not Sure</td>
</tr>
<tr>
<td>Getting blood from a person with HIV into a wound?</td>
<td>Yes</td>
<td>No</td>
<td>Not Sure</td>
</tr>
</tbody>
</table>
Activity ~ Week 6
Risk Factors

Things To Do this week:

- Read Crabwell Grommett.
- Then, enter the discussion area, and with your group, consider the following questions about Crabwell:
  - Did he die of natural causes?
  - What contributed to his death?
  - What are risk factors of heart disease?
- Now, work with your group to develop your own version of "Crabwell Grommett" for HIV/AIDS that focuses on risk factors.
- AND, provide a group response to the question: Why do people take risks when they have the knowledge of modes of transmission and risk factors and should be able to avoid risk situations?

Crabwell Grommett

On the morning of his 42nd birthday Crabwell Grommett awoke to a peal of particularly ominous thunder. Glancing out the window with bleary eyes, and heavy head, he saw, written in fiery letters across the sky:

SOMEONE IS TRYING TO KILL YOU CRABWELL!

With shaking hands Crabwell lit his first cigarette of the day. He didn't question the message, you didn't question messages like that. His only concern was, "WHO?"
At breakfast he requested his usual bacon and eggs instead of the cereal offered to him by his wife, Janet. "Someone is trying to kill me," he told Janet while absent-mindedly salting his eggs.

"Who?" she asked incredulously.

Crabwell slowly stirred the two sugars into his cup of favourite percolated coffee and shook his head. "I don't know," he said.

Convinced though he was, Crabwell didn't go to the police with his story. He decided he only course was to go about his daily routine and hope to somehow out-wit his would-be murderer. He tried to think it through on the way to the office, but the frustration of making up time by beating lights and switching lanes totally occupied him. Nor, once behind his desk, could he find a moment to think what with the phones ringing every few minutes, urgent memos to deal with and the usual business problems and decisions piling up as they did each day.

It wasn't until his second glass of red wine at lunch that the full terror of his position struck him. It was all he could do to finish his steak and chips.

"I can't panic," he said to himself, lighting his lunchtime cigar, "I simply must live my life as usual."

So he worked until 7:00pm as usual, he drove home fast as usual, and he ate a hearty three course dinner as usual. After dinner he studied his business reports as usual, and took his usual two Mogadon tablets in order to get his usual six hours sleep. As the days passed, he purposefully stuck to his routine, and as the months went by, he took a perverse pleasure in his ability to survive. "Whoever's trying to get me hasn't got me yet," he would say to Janet, "I'm too smart for them."

"You need to take care Crabwell," Janet would reply, watching as Crabwell helped himself to a second serving of beef stroganoff.

The pride grew as he went on living for years. But, death came at last to Crabwell. It came at his desk on a particularly busy day at the office. He was 51.

Janet, mindful of Crabwell's fears about being murdered, demanded a full autopsy. But it showed only emphysema, arteriosclerosis, duodenal ulcers, cirrhosis of the liver, cardiac necrosis, a cerebrovascular aneurism, pulmonary oedema, obesity, circulatory problems, and lung cancer in its early stages.

"How glad Crabwell would have been to know," said Janet "that he died of natural causes."
Activity ~ Week 7
Learning & Logic

Things To Do this week:
In your groups, discuss:
• How do you move people from the bottom step to the top?
• What are the steps along the way?
• What educational programs can you put in place?
• What might they contain?
• Are you aware of any educational programs that are known to be effective.

This person is aware, educated and, where appropriate, engages in HIV/AIDS avoidance behaviours.

This person is unaware, uneducated and engages in high risk HIV/AIDS related activities.

Consider the above in light of the fact that, despite all the smoking prevention programs in existence, teenagers are taking up smoking at an increasing rate.
Activity ~ Week 10
Food Facts

THEME: "Food is an unnecessary addiction and leads to eating disorders."

Things To Do this week:
• Focus on the first section of the theme noted above.
• Enter the discussion area and in your groups, consider the following:
  • **Why do we need food?** (think about the nutrients in food, i.e., proteins, carbohydrates, fibre, fats, vitamins, minerals)
  • **What is necessary?** (think about food groups and recommended daily intake)
• Then, discuss the Dear Dolly questions below and provide a group response for each.

Dear Dolly:
I am dissatisfied with my body shape and have heard of a group called, Airians. They exist on air alone and are able to metabolise nutrients internally. My friend tells me that it is the ultimate diet and will guarantee weight loss. My friend says that new research shows food to be unnecessary. Can you help me?

Sincerely, Living On Air

Dear Dolly:
Thank you to the answer to my last question, I understand now that food is necessary. My problem now is understanding how to organise my food intake so that I am most likely to get the balance in my diet that you said was necessary. Please help!

Regards, Unbalanced.

Dear Dolly:
Thanks for the information on food groups -- that will certainly help. But just one last thing, you mentioned RDI's. I'm not clear on them and certainly don't know how they relate to diet. Could you please explain and give me some examples? Is it a problem if I do not achieve recommended RDI's

RDWhat?
Activity ~Week 11
Food Choices

THEME: "Food is an unnecessary addiction and leads to eating disorders."

Things To Do this week:
- Each member of your group should respond to the Food Choices true/false questions listed below.
- Once you've provided your individual response, enter the discussion area, use the true/false questions to help your discussion about the following:
  - Define addiction as it may possibly relate to food.
  - Give examples of your own addicted behaviour in regard to food.
- Then, discuss the following case study and provide a group response:
  Chris is a 19 year old uni student whose eating habits are limited to the traditional Australian diet. Chris has never tried international food (such as Asian cuisine) and never eats raw vegetables.

How would you get Chris to change dietary patterns?

<table>
<thead>
<tr>
<th>People eat when they are not hungry.</th>
<th>TRUE</th>
<th>FALSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>People eat according to taste, texture and presentation and not for nutritional value.</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>People's diets are determined by culture.</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
<tr>
<td>People's diets are influenced by their lifestyle.</td>
<td>TRUE</td>
<td>FALSE</td>
</tr>
</tbody>
</table>
Activity ~Week 12
Body Image

THHEME: "Food is an unnecessary addiction and leads to eating disorders."

Things To Do this week:
- Each member of your group should respond to the Body Image questions listed below.
- Then, enter the discussion area and use your responses and those of your group members to focus your discussion on the following questions:
  - Is there a relationship between real body shape, perceived body image and diet?
  - How important is your body image to you? How does this compare with the rest of your group?
  - Is body image overemphasised in society?
  - Are physical education students too preoccupied with body image? How might the concept of body image affect their role as health educators?

Please respond to the following questions:

<table>
<thead>
<tr>
<th>How tall are you?</th>
<th>How much do you weigh?</th>
</tr>
</thead>
<tbody>
<tr>
<td>metres</td>
<td>kg</td>
</tr>
</tbody>
</table>

Do you consider yourself:
- Overweight
- Underweight
- Just Right

Choose the statement you most identify with:
- I am happy with my body shape.
- No, I'm not happy with my body shape.
- My body shape could be better.

My main nutritional disorder is:
- I eat too much.
- I eat too little.
- I don't eat the right balance of food.
- I'm just fine.
Welcome to the Web and this week's tutorial!
In this week's lecture we looked at communicable diseases and focused on aspects of their epidemiology and an important concept associated with communicable diseases -- The Chain of Infection.
Of course, you can fill in the following box:

A communicable disease is...

And of course you understand the concept and implications associated with The Chain of Infection

To interrupt the spread of a communicable disease it is necessary to remove a link in the chain of infection. If the spread is to be interrupted by removing the mode(s) of transmission, then how the disease is transmitted should be known and behaviour adapted accordingly.

We could explore the idea of modes of transmission using any of the communicable diseases, but the disease chosen is HIV/AIDS. We will learn more about HIV/AIDS next lecture when we focus specifically on it as an example of a communicable disease, particularly sexually transmitted diseases.

If we want to interrupt the spread of HIV/AIDS, we may decide to intervene by removing the modes of transmission link. This can be only done effectively if we know the modes of transmission. How much do you know? Have a go at the following questions:
### Which of these situations can transmit HIV?

<table>
<thead>
<tr>
<th>Situation</th>
<th>Yes</th>
<th>No</th>
<th>Not Sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Having a blood transfusion in Australia?</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
</tr>
<tr>
<td>Being cried on by a person with HIV?</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
</tr>
<tr>
<td>Hugging and kissing a person with HIV?</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
</tr>
<tr>
<td>Treading on a needle with HIV-infected blood in it?</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
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<tr>
<td>Sharing plates and cutlery with someone with HIV?</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
</tr>
<tr>
<td>Having penetrative sex without a condom?</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
</tr>
<tr>
<td>Sitting on a toilet seat after a person with HIV has sat there?</td>
<td>☑️</td>
<td>☑️</td>
<td>☑️</td>
</tr>
<tr>
<td>Getting blood from a person with HIV into a wound?</td>
<td>YES</td>
<td>NO</td>
<td>NOT SURE</td>
</tr>
</tbody>
</table>

Your responses to these questions and the responses of your group members will be displayed in the Individual Responses section.
Activity ~ Week 4
Modes of Transmission
Group Tasks

Okay, now comes the interesting part! Answering them is one thing, explaining them is another!

1. Enter the Discussion Area and explain/defend/argue your choice for each question.
   Keep the discussion going with your group until you reach consensus to the answers to the questions. If you believe your peers are wrong, tell them so and direct them to a source of correct information.

2. The next task for your group is to list the Modes of Transmission of HIV/AIDS.
   Again, do this by dialoguing with your group until you agree on a list using the Discussion Area.

3. So far so good! Your next task, should you decide to accept it (and it will be Mission Impossible if you do not), is to consider The Chain of Infection.

Remember, the concept of the chain is to remove one or more links in order to prevent the spread of communicable disease.
   So, explain, with regard to HIV/AIDS, which links you would remove and why.

   In the Discussion Area, discuss with your colleagues your ideas and reach consensus with them on the explanation(s).

4. One last little task. Go back to your consensus answer on Modes of Transmission. Do you notice anything about the modes? Consider them in terms of risk factors for health. Does this help? Yes? Good, tell your colleagues. No? Let's hope your colleagues can help you!
   Anyway, into the Discussion Area and see what you can work out.

5. Done? Great, now your group leader (or their designate) can go to the Submit Page and enter your group work. For this week it should include:
   - Group consensus on the responses to each of the mode of transmission questions.
   - Group list of the modes of transmission of HIV/AIDS.
   - Group consensus on the chain of infection -- which link to remove and why.
   - Group response to what is noticeable about the modes of transmission for HIV/AIDS.
Well how are you going with this Web stuff? It's a buzz, isn't it? OK, let's get into it for this week...

You now are aware of the concepts related to communicable disease - viz the nature of communicable disease; the chain of infection, and the course of diseases in general. You have also explored sexually transmitted disease as examples of communicable disease concepts. Given these understandings, we can move on.

Communicable diseases and chronic diseases share certain commonalities and one of them is the concept of RISK FACTORS. We have mentioned risk factors in previous lectures and tutorials in relation to chronic diseases, communicable diseases and health in general.

Of course, you can fill in the following box:

A risk factor is...
Activity ~ Week 6
Risk Factors
Group Tasks

Clearly, in terms of raising health status or facilitating health promoting behaviours, awareness and knowledge of risk factors is important. Many people do not, however, even acknowledge the presence of risk factors in their lives. Consider the following...

Crabwell Grommett

On the morning of his 42nd birthday Crabwell Grommett awoke to a peal of particularly ominous thunder. Glancing out the window with bleary eyes, and heavy head, he saw, written in fiery letters across the sky:

SOMEONE IS TRYING TO KILL YOU CRABWELL!

With shaking hands Crabwell lit his first cigarette of the day. He didn't question the message, you didn't question messages like that. His only concern was, "WHO?"

At breakfast he requested his usual bacon and eggs instead of the cereal offered to him by his wife, Janet. "Someone is trying to kill me," he told Janet while absent mindedly salting his eggs.

"Who?", she asked incredulously.

Crabwell slowly stirred the two sugars into his cup of favourite percolated coffee and shook his head. "I don't know," he said.

Convinced though he was, Crabwell didn't go to the police with his story. He decided he only course was to go about his daily routine and hope to somehow outwit his would-be murderer. He tried to think it through on the way to the office, but the frustration of making up time by beating lights and switching lanes totally occupied him. Nor, once behind his desk, could he find a moment to think what with the phones ringing every few minutes, urgent memos to deal with and the usual business problems and decisions piling up as they did each day.

It wasn't until his second glass of red wine at lunch that the full terror of his position struck him. It was all he could do to finish his steak and chips.

"I can't panic," he said to himself, lighting his lunchtime cigar, "I simply must live my life as usual."

So he worked until 7:00pm as usual, he drove home fast as usual, and he ate a hearty three course dinner as usual. After dinner he studied his business reports as usual, and took his usual two Mogadon tablets in order to get his usual six hours sleep.

As the days passed, he purposefully stuck to his routine, and as the months went by, he took a perverse pleasure in his ability to survive. "Whoever's trying to get me hasn't got me yet," he would say to Janet, "I'm too smart for them."

"You need to take care Crabwell," Janet would reply, watching as Crabwell helped himself to a second serving of beef stroganoff.

The pride grew as he went on living for years. But, death came at last to Crabwell. It came at his desk on a particularly busy day at the office. He was 51.
Janet, mindful of Crabwell's fears about being murdered, demanded a full autopsy. But it showed only emphysema, arteriosclerosis, duodenal ulcers, cirrhosis of the liver, cardiac necrosis, a cerebrovascular aneurysm, pulmonary oedema, obesity, circulatory problems, and lung cancer in its early stages.

"How glad Crabwell would have been to know," said Janet "that he died of natural causes."

Well, what do you think of Crabwell -- death by natural causes?

1. Enter the Discussion Area and, with your group members, consider the following:
   - Did Crabwell Grommet die of natural causes?
   - What contributed to his death?
   - What are the risk factors of heart disease?
   After you've discussed this with your tutorial group, develop a "Coroner's Report" in no more than 100 words that succinctly answers the above questions.

2. Now, let's extrapolate a little from Crabwell. Let's assume Crabwell died from HIV/AIDS related diseases. What behaviours, lifestyle patterns or lifestyle decisions could he have engaged in that lead ultimately to his death?

   Use the Discussion Area to work with your group and rewrite, in no more than 250 words, Crabwell Grommett to reflect the risk factors of HIV/AIDS.

3. In both examples of (the original and the one you've just written) Crabwell embraced risk factors associated with the disease. If we assume that Crabwell knew his behaviours were potentially detrimental to his health, then Crabwell is like most people who have the knowledge about risk factors yet embrace them anyway.
   - Why do people take risks when they have the knowledge to avoid them?
   - Why do people engage in potentially health compromising behaviours when they know better?

   Use the Discussion Area to consider the above with your group -- it is crucial to your future as a health educator.

4. Done? Now your group leader can go to the Submit Page and provide your group work which should include:
   - Coroner's Report (no more than 100 words).
   - New version of Crabwell (no more than 250 words).
   - Group consensus on the questions related to why people take risks and engage in health compromising behaviours.
Welcome back for your third and final Web week! Now, have you got this cyber tutorial business aced? Of course it has its drawbacks -- surely you are missing Prof. Patterson's happy, smiling face and demure personality (be careful he reads this!!!).

Okay, let's take stock - complete the following:

<table>
<thead>
<tr>
<th></th>
<th>I know and can explain.</th>
<th>Well, sort of.</th>
<th>Hope it's not asked on an exam.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Health Field Concept</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homeostasis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk Factor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Epidemiology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>John Snow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communicable Disease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chain of Infection</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Your responses to these questions and the responses of your group members will be displayed in the Individual Responses page.
Activity ~ Week 7
Behaviours & Behaviour Change
Group Tasks

• Okay, it's back into the Discussion Area with your group, pick one of the nine concepts you've just assessed your knowledge on and ask one of your peers to explain. The concepts were:

<table>
<thead>
<tr>
<th>Health</th>
<th>Health Field Concept</th>
<th>Homeostasis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disease</td>
<td>Risk Factor</td>
<td>Epidemiology</td>
</tr>
<tr>
<td>John Snow</td>
<td>Communicable Disease</td>
<td>Chain of Infection</td>
</tr>
</tbody>
</table>

How do you think they went? What would Prof. Patterson give it out of 5?

2. Right, so your know your stuff. BUT, consider these questions:
   • Why do you need to know this?
   • What does this add to your role as a PDHPE professional?
   • What is your role or your mission as a PDHPE professional?
Use the Discussion Area to do this and reach a group consensus -- put your group thoughts in a paragraph which could be a role statement for a PDHPE professional such as yourself.

3. Quite clearly your role has a high level of involvement in reinforcing or facilitating appropriate health behaviours in your students such that their health status is maximised. But, the reinforcement and especially the facilitating is easier said than done - understanding and influencing health behaviour is a complex task. Look at the following:

   Animated graphic inserted here on Web.

In your group, use the Discussion Area to consider the following questions and come to a consensus:
   • How do you get people to change their behaviour?
   • What stages do people go through in making a behaviour change?

4. Finally, health education programs are used to facilitate behaviour change. Think of school health education programs and, using the Discussion Area, come up with a group response to the following:
   • How do they work?
   • What is their theoretical basis?
5. Done? Great, now your group leader (or their designate) can go to the Submit Page and enter your group work. For this week it should include:

- The explanation of a concept and the rating out of 5.
- Role statement for a PDHPE professional.
- Group consensus on:
  - How do you get people to change their behaviour?
  - What stages do people go through in making a behaviour change?
- Group consensus on:
  - How do health education programs work?
  - What is the theoretical basis of health education programs?

Then, JUST THINK, you'll be finished with Web tutorials and you get to go back to the classroom experience with Prof. Patterson!
Welcome to the new group of WWW: Wollongong Web Warriors!

Now that you have enjoyed a fantastic break, completed the first exam and handed in the major assignment there is only the downhill run to the finish.

Beware ~ people have been known to come to grief on the downhill run...

To theoretically frame these tutorials, we will be using the PRECEDE model. Of course, we could have used the Health Belief model and you could now explain the similarities and differences between the two.

Give it a go here...

In the PRECEDE model there are three factors that influence health behaviour learning and health behaviour change.

With regard to nutrition, effective health behaviour is contingent upon having strong predisposing factors -- especially in terms of knowledge -- that help make appropriate food choices.
The essential nutrients we need for healthy body functioning are:

<table>
<thead>
<tr>
<th>Proteins</th>
<th>Vitamins</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrates</td>
<td>Minerals</td>
</tr>
<tr>
<td>Fats</td>
<td>Water</td>
</tr>
</tbody>
</table>

Logically, there are certain levels of these nutrients that are required for effective functioning. In Australia, these levels are identified as RDIs -- Recommended Daily Intake. And, to assist people in making appropriate food choices so they achieve the RDIs, foods are grouped.

List the major food groups...

To further assist the understanding of food and nutrition, nutritionists use the concept of a pyramid to facilitate appropriate food choices.

Explain the food pyramid...

Explain why some educators represent the pyramid upside down...

Okay, now for your final task before getting it together with your group.

- Go back to the Essential Nutrients list.
- For each nutrient, come up with two questions which you regard as important knowledge about that nutrient.
  - Note, here's an example of a question from Patto, What are the six most important vitamins?
You can put your questions here...

Questions for Water:

Questions for Protein:

Questions for Carbohydrates:

Questions for Fats:

Questions for Vitamins:

Questions for Minerals:

Okay, have you filled in all the boxes above?

• No, well now would be the time to scroll up and complete them -- your group is depending on you.

• Yes, okay click on the submit button below and you'll automatically go to the group task page for this week. Here you'll find out what you need to work on with your group.

By the way, whenever you want to see the responses to the questions above (once you've submitted them of course), and the responses submitted by your other group members, just click on the "Individual Responses" link.
Activity ~Week 11
Food Facts
Group Tasks

Okay, now your group should use the Discussion Area to work on the following tasks. Here's your mission:

1. Okay, how did you all go on the major food groups?
   - Refer to the Individual Responses page to see each member's answer.
   - Use the Discussion Area to decide on a final list of the major food groups.

2. Too easy? Now for the food pyramid... What is it all about and why do some educators represent the pyramid upside down?
   - Check out what each of your group members said in the Individual Responses page.
   - Use the Discussion Area to come up with a group consensus response.

3. Now for the third and final task... You've all submitted two questions for each essential nutrient. So, if you check out the Individual Responses page there should be eight or ten questions for each nutrient, right?
   Okay, now your group should choose the two most significant/important questions for each nutrient. Now, using the Discussion Area, come up with a group answer to each question for each nutrient.

4. Done? Great, now your group leader (or their designate) can go to the Submit Page and enter your group work. For this week it should include:
   - List of food groups.
   - Explain the food pyramid and why some educators represent it upside down. Two questions AND answers for EACH essential nutrient. That's a total of 12 questions and answers.
Holy shemoli Batman

Another week over; another pop quiz completed; and more steps taken on the road of life!

Last week in the tutorial we looked at one aspect of nutrition related to the predisposing facet of the PRECEDE model – knowledge.

**ONLINE POP QUIZ - Test your knowledge**

<table>
<thead>
<tr>
<th>Statement</th>
<th>True</th>
<th>False</th>
</tr>
</thead>
<tbody>
<tr>
<td>An average adult digests 500 kg of food per year.</td>
<td>True</td>
<td>False</td>
</tr>
<tr>
<td>Raspberries have the highest level of dietary fibre.</td>
<td>True</td>
<td>False</td>
</tr>
<tr>
<td>One kiwi fruit has twice the RDI for vitamin C.</td>
<td>True</td>
<td>False</td>
</tr>
</tbody>
</table>
Activity ~Week 12
Food Choices & Weight Management
Group Tasks

How did you go? How is your heart rate? Lucky that quiz was just for fun - the answers are TRUE, TRUE, and TRUE.

Now, consider the following:

Ron is 22 years of age. He is considerably overweight. He is more sedentary than active; not very knowledgeable about nutrition; and, indecisive about life.

His employer has hired your group to present a work site health promotion program to Ron and his work colleagues (many of whom share the same characteristics as Ron).

1. Consider the predisposing factors associated with Ron's problem - particularly knowledge. What should Ron and his colleagues know about nutrients, food groups, RDI's, and energy value of foods?
   • In the Discussion Area, outline your own thoughts on these matters and and discuss them with your group until you reach a consensus.

Now that was the easy part - essentially you have answered an important part of the question 'what does one need to know about losing weight and weight management?'

But we know there is often a gap between knowledge and behaviour. This gap may be explained by aspects of the Health Belief model or by aspects of the PRECEDE model.

To make changes and improve their health behaviour, people need skills and abilities they often do not possess or have not mastered. In terms of the PRECEDE model, these are ENABLING factors (you know that!!).

2. Consider the ENABLING factors associated with weight management for Ron and his colleagues.
   • In the Discussion Area, list and, in a sentence, explain these factors to others in your group. Then, come up with a group consensus about these factors and a program as to how these factors might be enhanced.

3. In developing your program, also consider the external factors in Ron and his colleagues' life which might precipitate their nutritional behaviour, e.g., Ron eats at 6pm every day whether or not he is hungry; he buys donuts every time he walks past a donut shop.
   • As a group, think of 3 creative things that could be done with regard to Ron and colleagues' external environment to help improve their nutritional behaviour.

When your group has worked all this out your group leader (or their designate) can go to the Submit Page and enter your group work. For this week it should include:
• What Ron and his colleagues should know about nutrients, food groups, RDI's, and energy value of foods.
• A group consensus regarding enabling factors associated with weight management and a program as to how these factors might be enhanced.
• 3 creative things that could be done with regard to Ron and colleagues' external environment to help improve their nutritional behaviour.
Do you remember Ron from last week? Well, unfortunately, like many people, Ron failed to lose weight. Now, his self-esteem is low, he believes his life is out of control, and his self-image is unrealistic.

Lots of people are like Ron - they have an unrealistic body image. Some believe they are too fat/large/overweight and may adopt inappropriate dietary strategies to deal with it. Some go to extremes and refuse to eat or eat and then remit the food using laxatives or vomiting.

Are you like a lot of other people, including Ron? Respond to the following:

- Do you consider yourself:
  - [ ] V. T-J
  - [ ] J
  - [ ] My main nutritional disorder is:

- Choose the statement you most identify with:
  - [ ] (click bar to reveal all options)

- My main nutritional disorder is:
  - [ ] (click bar to reveal all options)
Now, think about how you have responded to those questions as you work on your group tasks. (Remember your answers and the answers of your group members can be found on the "Individual Responses" page).

1. Consider the following question:
   **How important is your body image to you?**
   Now, **EACH** member of the group can respond to this question in the **Discussion Area**. Then, in a paragraph on the **Submit Page**, synthesize the general feeling of your group members.

   So, how's your group going?
   Concerned about body image or pretty relaxed about it?
   Do you think your group is representative of society in general?

2. Take a look at the following statement:
   **Body image is overemphasised in society.**
   Okay, **EACH** member of the group should defend or refute it and substantiate their position with one piece of evidence in the **Discussion Area**. Discuss the issue until you've come up with a group consensus which includes evidence provided by each group member -- put that on the **Submit Page**.

   Now let's make a GIANT assumption -- let's assume you defended the above statement. Let's also assume that teenagers, especially females, are the most vulnerable in this regard. You will be in the front line of educating them in the future.

   But, there are a lot of people out there who think the last people who should be dealing with sensitive issues like body image (and sexuality, and drugs, and...) are physical educators. Some people argue physical and health educators are not trained for these things, they are not good role models and they are too preoccupied with strong, athletic bodies -- they are just 'Jocks'.

3. Using the **Discussion Area**, consider the issues embedded in this position with your group and present a group response.
   When your group has worked all this out your group leader (or their designate) can go to the **Submit Page** and enter your group work. For this week it should include:
   - A synthesis of the group members' response to: "**How important is your body image to you?**"
   - A group consensus (with evidence) defending or refuting the statement: "**Body image is overemphasised in society.**"
• A group response to the suggestion that physical and health educators are inappropriate to deal with issues related to body image because they are preoccupied with strong, athletic body images.

THEN, that's it! That's all!
You've completed the Web tutorials.
Next week it's back to the 67.303!
Appendix J: General Information Questionnaire

HEALTH AND HEALTH BEHAVIOUR RESEARCH STUDY
GENERAL INFORMATION QUESTIONNAIRE

This questionnaire is designed to gather some general information about you and your experience with computers. There are no right or wrong answers and your responses to these questions will not, in any way, impact on your mark in this subject. Please answer each of the questions below.

Number:  

1. Gender:  

   □ Female  □ Male

2. Age:  

Did you complete the 2 Unit PDHPE?  

   □ Yes  □ No

Computer Experience

Please respond to the following questions about your experience with computers and the World Wide Web.

3. Place a tick (✓) in the box above the statement which best describes your experience using a computer:

   □ I have NO experience with computers  
   □ I have A LITTLE experience with computers  
   □ I have A LOT of experience with computers

4. Place a tick (✓) in the box above the statement which best describes your experience using the World Wide Web:

   □ I have NO experience with the World Wide Web  
   □ I have A LITTLE experience with the World Wide Web  
   □ I have A LOT of experience with the World Wide Web
Appendix K: Computer Attitude Questionnaire

**HEALTH AND HEALTH BEHAVIOUR RESEARCH STUDY**
**COMPUTER ATTITUDE QUESTIONNAIRE**

This questionnaire is designed to find out about how you feel about using computers. There are no right or wrong answers and your responses to these questions will not, in any way, impact your mark in this subject. Please answer each of the questions below.

Number: __________________________________________

Please respond to each of the following statements about computers. Circle the number that best reflects your response to each statement. You may choose from five responses for each statement:

<table>
<thead>
<tr>
<th>Number</th>
<th>Statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I feel at ease when I am around computers.</td>
</tr>
<tr>
<td>2</td>
<td>I feel comfortable when a conversation turns to computers.</td>
</tr>
<tr>
<td>3</td>
<td>Learning about computers is boring to me.</td>
</tr>
<tr>
<td>4</td>
<td>I like learning on a computer.</td>
</tr>
<tr>
<td>5</td>
<td>Working with a computer would make me very nervous.</td>
</tr>
<tr>
<td>6</td>
<td>I feel aggressive and hostile toward computers.</td>
</tr>
<tr>
<td>7</td>
<td>Computers make me feel uncomfortable.</td>
</tr>
<tr>
<td>8</td>
<td>I get a sinking feeling when I think of trying to use a computer.</td>
</tr>
<tr>
<td>9</td>
<td>I would feel comfortable working with a computer.</td>
</tr>
<tr>
<td>10</td>
<td>Computers make me feel uneasy and confused.</td>
</tr>
<tr>
<td>11</td>
<td>I'm not the type to do well with computers.</td>
</tr>
<tr>
<td>12</td>
<td>I would like working with computers.</td>
</tr>
<tr>
<td>13</td>
<td>The challenge of solving problems with computers does not appeal to me.</td>
</tr>
<tr>
<td>14</td>
<td>I think working with computers would be enjoyable and stimulating.</td>
</tr>
<tr>
<td>15</td>
<td>I do not enjoy talking with others about computers.</td>
</tr>
<tr>
<td>16</td>
<td>Learning about computers is interesting.</td>
</tr>
<tr>
<td>17</td>
<td>I enjoy using a computer.</td>
</tr>
<tr>
<td>18</td>
<td>Computers are boring.</td>
</tr>
<tr>
<td>19</td>
<td>Learning about computers is something I could do without.</td>
</tr>
<tr>
<td>20</td>
<td>Computers are not exciting.</td>
</tr>
<tr>
<td>21</td>
<td>Studying about computers is a waste of time.</td>
</tr>
<tr>
<td>22</td>
<td>It is fun to figure out how computers work.</td>
</tr>
<tr>
<td>23</td>
<td>Learning about the different uses of computers is interesting.</td>
</tr>
<tr>
<td>24</td>
<td>I enjoy learning how computers are used in our daily lives.</td>
</tr>
</tbody>
</table>
Appendix L: Instrument Expert Review Panel Members

Dr. John Patterson
Dean and Professor in Physical and Health Education
Faculty of Education, University of Wollongong

Ms. Yvonne Kerr
Sub-Dean and Senior Lecturer in Physical and Health Education
Faculty of Education, University of Wollongong

Ms. Meg Pickup
Lecturer in Health Education
Faculty of Education, University of Sydney
### Facts about HIV/AIDS:

Please respond to the following statements about HIV/AIDS as it relates to Australia. Please tick (\(\checkmark\)) the TRUE box for those statements you think are correct, the FALSE box for those statements you think are incorrect. Tick (\(\checkmark\)) the NOT SURE box if you are uncertain about the answer to a particular question.

<table>
<thead>
<tr>
<th>Number</th>
<th>True</th>
<th>False</th>
<th>Not Sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In relation to HIV, one high risk contact would be a serious event.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. The most important mode of transmission of HIV involves any exchange of body fluids.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Self-efficacy is important before voluntary health behaviour change can occur.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. An injury from stepping on a discarded needle point presents a low level of risk for the transmission of HIV.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Once a person has contracted the HIV virus, he/she will be able to transmit the virus for the rest of his/her life.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. HIV can be transmitted from mother to child during pregnancy.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Tongue kissing with a person infected with HIV is a high risk behaviour for transmitting the virus.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Self-awareness is a precursor in the voluntary behaviour change process.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. A person can contract HIV by coming into contact with infected breath.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. The HIV virus actually attacks the immune system.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. The process of health behaviour change is well understood.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12. Among women, only those who have bisexual sex partners are at risk of contracting HIV.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. The incidence of AIDS in women is increasing.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. Risk of AIDS can be reduced by adopting appropriate behavioural strategies.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15. HIV is not a disease.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. HIV is a highly contagious virus.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. Studies have shown that insect bites transmit HIV.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Attitudes related to HIV/AIDS:

Please respond to the following by placing a tick (✓) in the box that best reflects your response to each statement.

<table>
<thead>
<tr>
<th>Number</th>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>The HIV/AIDS problem is something I haven't given much thought to as it doesn't really interest me.</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
</tr>
<tr>
<td>19</td>
<td>I would be worried about sharing a flat with somebody with HIV because of the risk involved in catching the virus.</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
</tr>
<tr>
<td>20</td>
<td>I would have no difficulty being friends with someone with AIDS.</td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>21</td>
<td>I wouldn't accept someone else's blood, if I required a transfusion, because of the risk of HIV/AIDS.</td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>22</td>
<td>I wouldn't want to play a contact sport against someone who had HIV.</td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>23</td>
<td>As a physical education teacher, I would have no difficulty with having a student with HIV in my class.</td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

### Behaviours related to HIV/AIDS:

Please respond to the following by placing a tick (✓) in the box that best reflects your behaviour in the situations noted below.

<table>
<thead>
<tr>
<th>Number</th>
<th>Statement</th>
<th>Always</th>
<th>Almost Always</th>
<th>Sometimes</th>
<th>Hardly Ever</th>
<th>Never</th>
<th>Not Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>I use a condom when having sex.</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>25</td>
<td>I avoid sexual relations with new partners until I know their sexual history.</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>26</td>
<td>When I go to a new doctor or dentist, I check that they follow appropriate sterilisation procedures.</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>27</td>
<td>When having sex with a partner whose sexual history I'm unsure of, I use a condom.</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>28</td>
<td>I have changed my sexual behaviour because of my knowledge and awareness of HIV/AIDS.</td>
<td>☐</td>
<td>☐</td>
<td>☒</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

*Thanks for taking the time to respond to this questionnaire!*
This questionnaire is designed to address knowledge, attitudes and behaviours related to nutrition. Your responses to these questions will not, in any way, impact on your mark in this subject. Please answer each of the questions below.

**Facts about Nutrition**

Please respond to the following statements about nutrition by placing a tick (✓) in the TRUE box for those statements you think are correct, the FALSE box for those statements you think are incorrect. Tick (✓) the NOT SURE box if you are uncertain about the answer to a particular question.

<table>
<thead>
<tr>
<th>Number</th>
<th>True</th>
<th>False</th>
<th>Not Sure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. One way for people to increase the amount of fibre in their diets is to eat more fruit.</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>2. Fat is the main energy source for the body.</td>
<td>☑</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>3. Dietary fibre is soluble or insoluble in the large intestine.</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>4. Calcium supplements are necessary to prevent osteoporosis.</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>5. Anorexia nervosa is related to a distorted body image.</td>
<td>☑</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>6. Vitamins are essential organic compounds that promote growth and reproduction and help maintain life and health.</td>
<td>☑</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>7. Weight reduction causes a decrease in the number of fat cells.</td>
<td>☑</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>8. People with bulimia are underweight.</td>
<td>☑</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>9. Fibre helps reduce the risk of some types of cancer.</td>
<td>☑</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>10. Diet has only a small role to play in terms of a risk factor for the leading causes of death.</td>
<td>☑</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>11. Malnutrition refers to caloric insufficiency in diet.</td>
<td>☑</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>12. Foods that are low in cholesterol are low in fat.</td>
<td>☑</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>13. Diets that are very low in calories can cause serious health problems.</td>
<td>☐</td>
<td>☑</td>
<td>☑</td>
</tr>
<tr>
<td>14. A loss of 20% of water will result in death.</td>
<td>☑</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>15. Eggs are a common food allergy.</td>
<td>☑</td>
<td>☐</td>
<td>☑</td>
</tr>
<tr>
<td>16. Athletes who engage in carbohydrate loading should concentrate on simple rather than complex carbohydrates.</td>
<td>☑</td>
<td>☐</td>
<td>☑</td>
</tr>
</tbody>
</table>
### Attitudes related to Nutrition

Please respond to the following by placing a tick (✓) in the box that best reflects your response to each statement.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>17. Eating a healthy diet is important to me.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18. The pleasures of eating are more important than being concerned about the nutritional content of food.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20. Nutrition should be de-emphasised as a health concern.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21. Most people do not have to be concerned about nutrition.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22. Body image is overemphasised in society.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23. The relationship between nutrition and disease is overrated.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Behaviours related to Nutrition

Please respond to the following by placing a tick (✓) in the most appropriate box.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Always</th>
<th>Almost Always</th>
<th>Sometimes</th>
<th>Hardly Ever</th>
<th>Never</th>
</tr>
</thead>
<tbody>
<tr>
<td>24. I eat a healthy, balanced diet.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25. I put a lot of effort into understanding the nutritional value of what I eat.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26. My food choices are determined by convenience rather than by nutritional value.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27. Nutritional issues guide my eating patterns.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>28. On balance, I select food according to the health value rather than any other factor.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Thanks for taking the time to respond to this questionnaire!*
Appendix O: Web Use Questionnaire

HEALTH AND HEALTH BEHAVIOUR RESEARCH STUDY
WEB USE QUESTIONNAIRE

Number: ☐

This questionnaire is designed to gather some information on your use of the subject Web site and how you feel about using computers.

1) From where and when did you access the subject Web site? (✔) Check all that apply:

<table>
<thead>
<tr>
<th></th>
<th>Mornings</th>
<th>Afternoons</th>
<th>Evenings</th>
</tr>
</thead>
<tbody>
<tr>
<td>My home computer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uni computer labs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uni residence labs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A computer at my work</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2) Please place a tick (✔) beside the box that best reflects your response to the following statement:

I enjoyed using the Web site for the EDUP144 tutorials.

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neutral</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3 a) In terms of facilitating your understanding of the subject matter covered in EDUP144, do you think the Web tutorials were:

☐ as effective as the classroom tutorials
☐ more effective than the classroom tutorials
☐ less effective than the classroom tutorials

b) Please explain your choice for the above question:

3 b) Please note any additional comments you have on using the Web for tutorials.

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Appendix P: Interview Guide

In-depth Interview Guide

1. How did your group work together on the tasks for the classroom tutorials?
   • How did your group manage/organise to get the work done?
   • How did you arrive at decisions for completing the tasks?
   • Were there differences for individual weeks?

2. How did your group work together on the task for the Web tutorials?
   • How did your group manage/organise to get the work done?
   • How did you arrive at decisions for completing the tasks?
   • Did you encounter any problems working with your group during the on-line
     weeks?
   • Were there differences for individual weeks?

3. From where did the group use the Web site (lab, home, etc.)?
   • Did your group work on the tutorial task in person or just over the Web?
   • Did you log into the Web site at the same time or different times?
   • Were you all in the same lab?

4. Was the procedure of the Web tutorials easy to understand? What to do, how to
   do it?

5. Were the tutorial activities easy to understand? Did you like/dislike specific
   tutorials?
   Think about the individual tutorials --
   
   modes of transmission  food facts
   risk factors  food choices
   behaviour change  body image

6. What did you like about the Web tutorials? What didn't you like about the Web
   tutorials?

7. Are there aspects of the Web tutorials that you think are better than the
   classroom tutorials? Which aspects? Why?

8. Are there aspects of the Web tutorials that you think are not as good as the
   classroom tutorials?
   Which aspects? Why?

9. Do you think the Web tutorials are as effective / more effective / less effective
   than the classroom tuts in terms of facilitating your understanding of the subject
   matter?
   • Please explain why you think that?
10. Do you think you have more or less of an opportunity to express your point of view in Web tutorials than in classroom tutorials?

11. Do you feel that you participated more or less in the Web tutorials than in the classroom tutorials?

12. Do you feel your group members valued your participation? Did you notice any difference between the Web and classroom tutorials? In which circumstance do you feel that your input was most valued?

13. Did you recognise any differences in contribution by your group members? What were the differences?

14. Did you experience any technical difficulties using the Activity Centre?
   - If yes, what problems did you encounter? How were they resolved?
   - What impact did that have on completion of the tutorial (procedure and motivation)? ... Subsequent tutorials?

15. Is there anything you would suggest to enhance the Web tutorials?

16. Have you used other sections of the Web site?

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Outline</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Schedule</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resources &amp; Web Links</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Notice Board</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   - Which section was most useful?

17. Has using the subject Web site had an impact on your computer skills?
   - In what way?

18. Has using the subject Web site had an impact on your Web skills?
   - In what way?

19. Has using the subject Web site had an impact on your attitude towards using computers?
   - In what way?

20. Is there anything you would suggest to enhance the subject Web site generally?

21. Do you have any other comments to make regarding the tutorials or the Web site generally?
Ms L. Lockyer
Faculty of Education
University of Wollongong

Dear Ms Lockyer,

Further to my letter to you on 20 November 1997, I am pleased to advise that the duration of the approval to the amendments of the following Human Research Ethics application are as follows:

Ethics Number: HE97/229
Project Title: Delivering Health Education Via the World Wide Web: An Investigation of Knowledge Construction and Attitude Change Within Discourse-Based Instructional Strategies
Name of Researchers: Lori Lockyer
Approval Date: 23 October 1997
Duration of Clearance: 27 November 1998

This certificate relates to the research protocol submitted in your original application of 21 October 1997. It will be necessary to inform the Committee of any changes to the research protocol and seek clearance in such an event.

Please note that experiments of long duration must be reviewed annually by the Committee and it will be necessary for you to apply for renewal of this application if experimentation is to continue beyond the approval date.

Karen McRae
Secretary
Human Research Ethics Committee

cc: Assoc. Prof. Barry Harper, Supervisor
Health and Health Behaviour ~ EDUP144
Research Information Page

A World Wide Web site has been developed for Health and Health Behaviour, EDUP144. The Web site includes subject materials, links to resources related to topics covered in the subject, and an Activity Centre with discussion areas. Some of the tutorial time for this subject will be conducted within this Activity Centre. So, sometimes, instead of meeting in a face-to-face tutorial session, you will be meeting on-line, on the Web, to discuss the tutorial topics.

As a PhD student, I want to find out if the Web is an effective teaching and learning technology for developing knowledge and attitudes about health topics ~ specifically those covered in this subject. I also want to find out how learning using the Web might be different than the traditional, face-to-face tutorial setting. To do this I am requesting your participation in my research.

This is what I'll be doing:
• Asking you to complete surveys about particular health topics before and after you engage in your face-to-face or on-line tutorial about the topic.
• NOTE: your answers to these surveys will not count as assessments for this subject!
• Observing and recording the face-to-face and the on-line tutorials (with audio tapes and electronic logs) ~ only my supervisors and I will review the tapes and logs.
• Accessing the assessment tasks for the subject that are assigned and marked by your lecturer.
• Asking some of you to participate in an interview to discuss your thoughts about using the Web for health education purposes.

What you should know:
• This study will be both anonymous and confidential. In both the analysis and reporting of the data you will not be individually identified.
• As noted on the 'consent to participate' form, you are free to withhold consent or withdraw consent to participate at any time ~ it won't have any effect on your participation/assessment in the subject.

Thanks for helping me out with this study! If, at any time, you have any questions about the research, please don't hesitate to contact me.

Lori Lockyer, PhD Candidate
Faculty of Education
Room: 23.107 ~ Tel: 4221 5738
Email: lori_lockyer@uow.edu.au
Appendix S: Phase 2 Participant Consent Form

UNIVERSITY OF WOLLONGONG
Human Research Ethics Committee
Consent to Participate

Research Title: Delivering Health Education Via the World Wide Web: An Investigation of Knowledge Construction and Attitude Change Within Discourse-Based Instructional Strategies

Researcher: Lori Lockyer

This research project is being conducted as part of a Doctor of Philosophy supervised by Associate Professor Barry Harper and Professor John Patterson in the Faculty of Education at the University of Wollongong.

The researcher is carrying out a study on the use of the World Wide Web in delivering undergraduate health education.

The study will not discriminate between individual students and your anonymity will be maintained. The results of this study will be aggregated with no student being identified in the final report. Once the results have been collected and analysed, the initial data will be shredded. You are free to withhold consent or withdraw consent to participate in the research at any time without any negative effect on your participation in the subject or the course.

If you have any enquires regarding the conduct of the research please contact the Secretary of the University of Wollongong Human Research Ethics Committee on (02) 4221 4457.

If you wish to take part in this research please sign below:

I understand that the data collected will be used for the study entitled: Delivering Health Education Via the World Wide Web: An Investigation of Knowledge Construction and Attitude Change Within Collaborative Instructional Strategies by Lori Lockyer and I consent for the data to be used in that manner.

.......................................................................................... .......................................................................................... ......./....../......
Name (please print) Signature Date

Once you have signed this form, please return it to:

Lori Lockyer, PhD Candidate
Faculty of Education, University of Wollongong
Room: 23.107 ~ Tel: 4221 5738
EDUP144 Web Site Help Sheet

Tutorial 1 ~ Tuesdays 1.30-2.30pm

Address:
The address for the EDUP144 Web site is:

Access:
This site can be assessed from any computer that has an Internet connection and a WWW browser. The Endor Lab (room 104) in building 17 is booked for EDUP144 students from 1.30pm to 5.30pm every Tuesday.

Content:
The Web site includes the subject outline; the subject schedule; resources and links to external Web sites related to the topics we are studying; and, supports tutorial activities in the "Activity Centre". This is the main menu you’ll see on the home page:

Usernames and Passwords:
You can access the subject outline; the subject schedule; and resources and links to external Web sites straight away. BUT, you’ll need an individual username and password to access the "Activity Centre". Your username and password will be distributed in tutorial during week three. If you have any difficulties when trying to use your username and password or if you do not receive a username and password please see the subject tutor.

On-line Tutorials:
Your tutorial session ~ Tutorial 1 ~ which usually meets on Tuesdays between 1.30pm and 2.30pm will be experiencing on-line tutorials during weeks four, five and six of the session. That means you do not come to the usual tutorial meeting in 67.303 for those three weeks ~ instead you engage in the tutorial using the Web.
Tutorial Groups:
Just like when we meet face-to-face for tutorials, during on-line tutorial weeks you'll still work with your tutorial group and you will still be responsible for completing and submitting your group tutorial task by noon on the Monday before the following lecture.

On-line Tutorial Structure:
Each week the on-line tutorials will be structured this way:

1. You'll first go to a screen titled "This Week's Task Into." Here you'll receive a bit of background information on the topic and have some questions to answer.

2. When you submit your responses to the questions, those responses and the responses of all the other members in your tutorial group can then be found in the "Individual Responses" section of that week's on-line tutorial.

3. Also, when you submit your responses you'll be taken to the "Group Tasks" page. Here you'll get a detailed description of what your group tutorial task is for that week.

4. Now, the unique aspect of these on-line tutorials is actually working with your tutorial group on-line and you do this is the "Discussion Area". The Discussion Area is basically a chat space specific to your tutorial group ~ that means other groups will not be able to view the comments you and your group members make in your Discussion Area.

5. Once you've used the Discussion Area to work on your Group Tasks it is the responsibility of your group leader (or their delegate) to go to the "Submit Page" and submit your Tutorial Task for that week. That means the group leader fills in the form on the Submit Page, prints it out and adds it to your group folder AND THEN clicks on the "Submit Your Answers" button.

NOTES:
- The link for each week's on-line tutorial becomes "active" at noon each Tuesday.
- Tutorial Tasks must be submitted on-line using the Submit Page AND in your group folder to the tutor's office no later than noon on the Monday of the following week.
- The subject tutor will be available in the Endor lab during your regular tutorial time.