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Design and Use of E-Learning to Accelerate Progress Towards Sustainable Development

A Case Study

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Abstract

Billions around the world require access to effective learning opportunities if we are to create a sustainable world. E-learning represents one of the tools we can utilize to help deliver these learning opportunities. Unfortunately, the e-learning field is young and many of those working on its development have failed to build upon one another's progress. This thesis addresses key elements in e-learning courses, in general, with a focus on ways to improve e-courses designed to provide effective learning opportunities with concepts, tools and approaches for effecting societal behavioural change for sustainability. The thesis accomplishes this objective through review of the literature on e-learning, deep assessment of the e-learning corporate responsibility course "Chronos", assessment of how and what people learned as they worked with this course, and through investigations into a range of other e-learning and/or sustainability courses. Specifically, important roles and key ingredients in the learning process, questions to be asked during course design, potential course formats and conceptual pitfalls were addressed. Additionally, possible solutions tools, such a Laurillard's teaching strategy and Morgan's 13 questions for e-learning development, and new e-learning concepts are discussed.

Executive Summary

Background
This thesis was written on the premise that billions of people require effective learning opportunities on sustainable development if society is to make the transition to behaviour and societies that are sustainable. E-learning, if improved, can provide a powerful medium in fulfilling this urgent, ongoing effort.

The field of e-learning is young and already we see encouraging results from its usage. Simultaneously, we see an array of failures and unmet expectations. Unfortunately, it appears as if people working in the field are functioning in a disjointed manner, without the resources they require, and failing to build on their colleague's experiences. This thesis connects and highlights various developers' experiences and delves into the concepts, approaches, tools and techniques that are effective both for improving e-learning experiences, in general, but also to investigate those which are specifically useful for supporting learning, understanding, motivation and individual and group behaviour that will lead to more sustainable societies.

While the first generation of e-learning, as Morgan calls it, has achieved success in providing technical learning, something that is related to routine-based concepts or that which can be memorized, there is a need for the second and third generation to improve in the facilitation of soft-learning, or that which teaches 'soft' skills, like interpretation, which is crucial to the sustainability movement.

Theoretical grounding
Diana Laurillard developed criteria designed to lead to more successful e-learning experiences. Specific criteria from her work, such as her teaching strategy, have been incorporated into this thesis and help to provide the theoretical foundation. This material was helpful, particularly in assessing the manner in which 'teacher' and learner roles must be facilitated to create successful learning experiences. Laurillard also supports particular approaches such as the need to actively engage learners and situate learning, points that were corroborated in the literature and were congruent with the findings of the empirical research done for this thesis. Laurillard's work places great emphasis on human interactions in the learning process. However, surprisingly few of the participants who worked with the Chronos course offered in a standalone manner or without human interaction, seemed to have a problem with this approach or suggested that added human interaction was necessary.

Furthermore, the Norm Model, which sees behavioural change stem from alterations made to understanding, willingness, and systemic conditions, was used to provide additional theoretical foundation for this thesis. The Model provided a method by which participants' experiences could be broken down and analyzed to identify key observations and patterns. Analyses revealed that willingness and systemic conditions are the two most difficult factors to deal with, while the latter is seen as the most challenging to achieve.

E-learning
The literature provided a major source of information and support in this thesis. A wide range of researchers, experiences, studies, etc. helped to provide the author insight into what works in e-learning and how one can attempt to overcome the weaknesses that can arise, dependent upon the 'generation' of course design used, context, etc.

E-learning is burdened by a variety of unique challenges, such as being highly resource intensive to create, and in facing obstacles to creating and sustaining human interactions at a distance. While it is crucial to know the characteristics of target learners and to have them actively engaged is seen as valuable, learners can have a range of preferences and/or may be

accustomed to taking a more passive approach. Beyond knowing the target learners, where possible, providing a range of methods to learn the same material is beneficial for learners.

E-learning also presents a range of benefits such as potentially being cheaper, faster, more flexible in delivery, and it provides greater learner-control, something that was reported in the literature and found in this research to be particularly important in e-learning.

Methods

This thesis author used an action research approach and includes a case study. The case study involved an e-learning corporate responsibility course entitled Chronos, which was produced by the World Business Council for Sustainable Development and The University of Cambridge Programme for Industry.

Through this research, Chronos was given to three groups who completed a three stage questionnaire. The responses to these questionnaires were then used to analyze the participants' experiences[1]. The course was found to be a valuable tool with impressive levels of creativity and helped to build motivation in the course-takers. Simultaneously, the course was found to have a number of possible weaknesses. The course includes potentially risky corporate friendly bias that could cause discomfort for some learners. At times, this bias could also be misleading. Furthermore, Chronos appears to be missing key messages, such as getting learners to think systematically, to focus on core business strategy, to find low-hanging fruit, to practice double-loop learning, and to identify key environmental impacts. It appears that this course and other e-learning sustainability courses could benefit by including these concepts and from showing learners how to assess their own situation using the Norm Model giving them a loose but inclusive method to determine their greatest obstacles to change.

Those that took the course and engaged in the focus group found the entire experience to be very positive. This led to impressive changes for the betterment of the environmental performance of the company, which continued beyond the end of the thesis period in exploring how to make further environmental performance improvements. The improvements the company has made were due, at least in large measure, to having had some of their employees take the course and to participate in the action research focus group coordinated by this thesis author.

Amongst the Chronos course participants, it was very disappointing to see so *few* people, many of whom are considered to be relatively progressive and educated on the subject, who actually have or plan to make an effort to integrate the three pillars of sustainability – people, planet, profits.

Beyond the case study, other courses (some more e-learning-related than others), such as the International Institute for Industrial Environmental Economics' 'Introduction to Cleaner Production and Sustainable Development', were drawn upon for additional insights of how different educators have sought to improve e-learning experiences and to foster learning about sustainable development. These courses helped to demonstrate lessons such as how some have approached e-learning planning to conserve resources and that an internationally provided distance e-learning sustainability course can be successfully provided even if the participants and teacher never meet in person.

[1] Five people from one of these groups participated in a focus group which allowed for more in depth analysis of these particular participants' experiences.

Closing observations

The value in facilitating small changes which can add up to big differences was seen in the research, and yet, it is clear that without conscious, systematic change, aimed at weaving sustainability into the core strategies of our companies, citizens' lives and countries, we will fail to establish sustainable societies. E-learning courses, if properly developed, delivered, supported and updated can play a very significant role in the crucial transition to sustainable societies.

Recommendations

1) E-learning developers must make necessary preparation including, but not limited to:

    i) planning resource availability both in time and money (which can be very costly);

    ii) knowing the target learners and testing them and the course in question extensively;

    iii) knowing what other relevant e-learning developments have already been made and use the lessons from people who have developed and taken such courses.

2) E-learning should, when possible and appropriate:

    i) actively engage the learner;

    ii) situate the learning;

    iii) provide high levels of learner-control;

    iv) provide learners and buyers of e-learning with a solid understanding of the course objectives, purposes, requirements, etc. so as to establish the proper expectations;

    v) provide learners with flexibility in the methods they can select to learn the materials of the course;

    vi) provide learners with e-learning as part of a blended or integrated learning experience.

3) Laurillard's tools can be used as a valuable method to collect, analyze and compare a teacher's and learner's experiences with the objective of identifying the strengths and improving upon the weaknesses of a course.

4) When constructing a sustainability course the following concepts can be beneficial in addressing the social, environmental, or economic dimensions incorporated in an individual's private life, a particular job, company, region or country:

    i) identify the most significant (environmental) aspects;

    ii) identify and utilize the low-hanging fruit;

    iii) approach the opportunity to make potential changes in a systematic manner;

    iv) weave sustainability into the core of whatever context is in question;

    v) show learners how to and the need for engaging in double-loop learning;

vi) identify which changes can bring the greatest secondary benefits (i.e. cost savings, brand value improvements, etc.);

vii) follow and measure the impacts of the changes made.

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Definitions

Blended learning	This presents an opportunity to enrich learning through providing the experience in combination with multiple methods and/or media.
E-learning	Learning facilitated through various electronic media such as through CD-ROM.
Granular delivery	Providing content in small "byte-sized" pieces.
Interactivity	Two way engagement, with the intention of creating stimulation, whether such engagement is between the learner and a concept, the learner and the computer, the learner and another individual, the learner and a particular stimulus, etc.
Learning	The process of "sense making" or "making meaning".
Low-hanging fruit	Improvements (i.e. environmental) which can be made with little or the least effort.
'Mathemagenic' activities	Actions in which the student should engage as it is thought they can be required to learn effectively.
Norm Model	A model created by Håkan Hydén, which assesses norm creation and is made up of three components; knowledge, willingness and systemic conditions.
Single-loop and double loop learning	Single-loop learning relies upon the recognition and correction of a problem in line with a certain collection of norms and values. Double-loop learning requires the individual to step back from the situation, not simply focussing on the problem and given circumstances, but to question the norms and values themselves which govern that system.
Situated learning	Learning that is grounded in the learner's situation; this approach results in the fact that knowledge is processed in relation to the context in which it was learned.
Soft and technical learning	Soft learning, or that which focuses upon 'soft' skills, is more complicated, depends upon interpretation, and generally requires being positioned in context to make sense of what is being discussed. Technical learning is characterized by routines, conformity, and memorization and linked to technological issues or something such as workplace safety procedures; typically does not require a great deal of context and can be transferred from one applicable situation to another with general ease.
Standalone format	A course provided in a self-contained manner where the learner only interacts with the program and no other individuals outside of the course.
Sustainable development or sustainability	The integration of social, environmental and economic issues into actions with the intention of building a healthy society capable of continuing indefinitely.
Synchronous/ asynchronous interaction	The former involves real-time communication while the latter involves communication that does not take place in real-time.

1 Introduction

This chapter introduces the reader to the goals of the thesis. Specifically, the challenges facing e-learning development and how this medium can be used to help bring about greater sustainability in the world are discussed. The chapter includes the background, purpose, objectives, research questions, scope, limitations, and assumptions. Finally, the methodologies used in the thesis, including action and case study research and focus groups are also reviewed.

E-learning[2] or learning facilitated through various electronic media such as through CD-ROM or the Internet is growing rapidly and presents a great opportunity for spreading information and creating effective learning situations.[3] This growth is driven by the need for and potential of providing education in less expensive ways, increased access to information, effective learning and greater flexibility (Lockwood, Gooley, 2002, pg. xi). One area in which this technology is being used to spread information is sustainable development (SD). If we are to make sustainable societies a reality both in our own local areas, as well as at the global level, billions of people must have opportunities for effective learning about the economic, environmental and social issues which are typically seen as the interconnected facets of SD. They will need to be able to develop the associated concepts, skills, policies, procedures, technologies and, values that are necessary for SD. They must also be *'empowered'* to put these concepts into practice to transform their regions into sustainable societal patterns. This will have to be based upon a sound understanding of and the capacity to design and implement systematic approaches to the integration of these three facets of SD throughout all parts of their lives, including their, work, government, homes and leisure.

However, despite the great interest in e-learning there is "surprisingly little systematic research into its overall effectiveness as a learning medium" (Stephenson, 2001). While there is much more work to be done, a variety of e-learning courses aimed at making sustainable development a reality have been developed and demonstrate how e-learning can reach thousands if not millions of minds and potentially plant the seeds of change. However, if courses such as these are to be effective, it is important to know how to evaluate their effectiveness and to identify their strengths and weaknesses to optimize the learning experiences, thereby improving the ability of each *'student'* to bring sustainability to reality. It is anticipated that the insights and recommendations developed in this systematic analysis of current e-learning courses, will help developers improve their present courses or help new course developers to be more effective with the courses that they design and utilize.

Thesis statement:
This thesis is designed to identify and evaluate critical elements, concepts, tools and approaches for the development and utilization of e-learning courses in general, and in particular, those designed to facilitate change towards SD, with the ultimate goal of providing effective e-learning courses and programs that contribute to sustainable thinking and behaviour among engaged 'students of all ages' throughout the world.

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[2] This type of learning can either be a distance learning program or a component of another learning program, such as classroom learning. This thesis focuses primarily upon the distance learning potential.

[3] While 'e-learning' has been defined in a relatively broad and straightforward manner, it should be noted that there are a variety of terms and definitions used in this area, such as 'knowledge media' or limiting the definition to learning online.

1.1 Background

1.1.1 E-Learning: Lack of Research

The lack of research into the e-learning medium was stated in a previous paragraph; however, this point is now further elaborated upon. Diana Laurillard, a former Professor of Educational Technology and the former Pro-Vice Chancellor for Learning Technologies and Teaching at The Open University, in Milton Keynes, United Kingdom, is also a distinguished leader in the distance and e-learning field. She emphasized:

> "Research and development projects on educational media pay quantities of hard cash for development, lip-service to evaluation, and no attention to implementation. There is rarely enough cash to equip a decent programme of piloting, dissemination, and staff training. Development projects trust to luck and the dedication of enthusiasts to carry them through. Learning technologies have progressed well on the backs of enthusiasts, but cannot achieve their potential this way…" (She continued by stating) "a new medium or method rarely works well in its first implementation, but the academic community is failing to learn the lessons of experience. Too few academics build on each others' previous work in the field; journal articles do not critique others' work, they only mention it; research and development projects do not build on what has gone before, so the same conclusions are continually repeated." (Laurillard, 2002, pg. 6)

As a result people fail to make systematic progress or avoid mistakes that have already been made. Inglis et al. stated that "(i)n many institutions developments in the new knowledge media (or e-learning)[4] are ad hoc, occurring through individual creative endeavours rather than as a consequence of strategic and systematic planning" (Inglis, Ling and Joosten, 1999, pg. 23). While exceptions exist it appears that many, if not most new e-learning development stems from individuals pushing technological limits rather than focusing on how these developments impact learning. This has failed in producing a re-conceptualization of what is possible for learning through electronic means. (Alexander and Boud, 2001, pg. 4) Some authors emphasise that much of e-learning's potential has been lost, at least in the initial developments in the field, which 'blindly' transferred much from the traditional classroom approach to the computer where the technology was simply meant to substitute for both the teacher and the textbook (Alexander, Shirley and Boud, David, 2001, pg. 3).[5] In summation, despite the great amounts of money that have been spent in developing the e-learning field, "there is surprisingly little systematic research into its overall effectiveness as a learning medium" (Stephenson, 2001, pg. 35).

As unfortunate as this is, this fact helps to explain much about the current status of e-learning. In the process of reviewing the literature it became clear that while some refer to e-learning as something which has 'exploded' (Garrison et al., 2003, inside cover) others talk about how it has failed to meet those great expectations or how it has failed to grow in certain fields and regions (Ramsden, 1992 as cited in Laurillard, 2002, pg. 81). The observations may explain the tremendous growth driven by 'enthusiasts'. Simultaneously, the combination of failed planning, lack of money, failure to substantially build on others' work, and trusting the future of e-learning development to 'luck' may account for why there are currently so many unmet expectations.

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[4] While Inglis et al. do not explicitly define the term 'knowledge media' it is believed that they are using this term interchangeably with the term 'e-learning' or the term 'e-learning' as it has been defined in this thesis.

[5] This is not to say that the technology cannot be used in an attempt to substitute teachers and textbooks, so much as this was done in a blind manner, at least initially, which led to significant problems.

Furthermore, despite the recognition that developers and e-learning institutions need to "do things differently," the consensus as to what should be done does not exist. Additionally e-learning specialists have no clear standards of what e-learning should be (Blass and Davis, 2003). However, as Morgan (2005) emphasised, e-learning is still in its "infancy" and it would be premature to set any standards, at least those which are technically based, which could confine the development of the sector.

It is hoped that the work done in this thesis effectively brings together much of the disjointed work to which Laurillard and others have referred in a way that will help to improve our understanding of e-learning evaluation, and will contribute to more successful e-learning development in the future. The author hopes that the research into e-learning, the Chronos e-learning program[6] and into other e-learning courses will provide valuable inputs for improving the International Institute for Industrial Environmental Economics' (IIIEE) present and future e-learning courses/programs.

1.1.2 Soft-learning and Sustainability

There are fundamentally two kinds of learning. There is 'technical learning' which is characterized by routines, conformity, and memorization and linked to technological issues or something such as workplace safety procedures. Technical learning[7] typically does not require a great deal of context and can be transferred from one applicable situation to another with general ease. Morgan emphasized that due to its nature, technical learning can be more readily delivered through e-learning, without major difficulty. (Adams and Morgan, 2005, pg. 33; Morgan, 2005, August 5)

The other type of learning is soft-learning or focuses on 'soft' skills. This type of learning is more complicated, depends upon interpretation, and generally requires being positioned in context to make sense of what is being discussed. Examples of soft-learning can be seen in "personal self-development…improved work practice…ongoing competence development (e.g. in producing self-motivated, empowered problem solvers), and for supporting innovation and performance improvement in addressing complex issues in new and thoughtful ways" (Adams and Morgan, 2005, pg. 33). While a great deal can be placed under the heading of sustainability Morgan believes that the information, concepts, etc. which are typically characterized as part of the sustainability 'school' qualify as soft-learning and are highly dependent upon context. (Morgan, 2005, August 5) Soft-learning seems to be highly linked to, if not the same as, situated learning, espoused by Laurillard (that is discussed in section 2.1) and is extensively supported throughout the literature reviewed for this thesis.

If Morgan is right and the various important points discussed in the thesis surrounding learning and e-learning are as linked to Morgan's comments as they are thought to be, then the e-learning nature of this thesis is extremely relevant as we seek better ways of creating learning for sustainability and to deal with sustainability in society, in general, since these concepts require soft-learning approaches.

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[6] The Chronos e-learning program, developed by the World Business Council for Sustainable Development (WBCSD) and the University of Cambridge Programme for Industry (CPI), is a course designed to be used by corporate employees to help them understand the connections between the 'triple bottom line', their company, and their individual responsibilities to help their company to make improvements; see: www.sdchronos.org.

[7] It seems that most people have not bothered to discuss technical learning; maybe because they believe it to be simpler.

1.1.3 The UN DESD and the Twenty-Five Module Project

E-learning for SD makes up the main focus of this thesis. This focus is rooted in a recent expanded global emphasis driven by the United Nations Educational, Scientific and Cultural Organization (UNESCO) and other organisations involved with the UN Decade of Education for Sustainable Development (UN DESD [which runs from 2005-2015]; see Appendix I for more information on Agenda 21 and the UN DESD) that was officially launched in January 2005. Their website states that "(t)he vision of education for sustainable development is a world where everyone has the opportunity to benefit from quality education and learn the values, behaviour and lifestyles required for a sustainable future and for positive societal transformation (UNESCO, 2005)." The UN DESD is intended to work towards this vision through promoting education for sustainable development (ESD) by using a variety of channels and collaborating with organizations around the world.

Among the groups that are working on the UN DESD to contribute to meeting these goals is the Environic Foundation International of Washington D.C. (www.environicfoundation.org) together with academic partners at the University of Tennessee (http://www.cleanproducts.org) and with many other academic centers, worldwide. They are in the process of developing a twenty-five module sustainable development educational program that is to be web-based but which will also rely upon classroom educators to help to facilitate the learning. This twenty-five module program is being developed to provide educators, university students and citizens, more broadly, online access to an integrated SD educational program that will address twenty-five of the most important SD facets in an in-depth manner designed to: a. Increase the course-taker's awareness of the diverse elements of SD and how they are interconnected; b. Expand the 'course-taker's motivation to become engaged in helping to effect societal transition to SD; c. Support the course-taker's empowerment to work in partnerships to envision and to implement the changes that will be needed.

The twenty-five module project is being designed to be readily adapted to diverse needs and contexts that are supported by an educator or course facilitator. However, it is also likely that it will be utilised in a standalone manner, or where the learner is responsible for interacting with the pre-defined web-based program. If this is the case, then studying Chronos, which crosses over into many sustainable development areas and can be provided in a standalone manner, may provide guidance for the Twenty-Five Module Program developers from conceptual, organizational, content, tools, delivery, evaluation and dynamic support points of view.

1.1.4 IIIEE and CSR

Already, corporate (social) responsibility plays a major role in the IIIEE MSc program for Environmental Management and Policy. It is expected that as a subject and as a practice, its status will continue to be raised in most, if not all of the educational programs provided by the IIIEE, other universities, and potentially, in conjunction with the UN DESD. As such, it was more than appropriate that Chronos be selected to be used as a learning tool in this thesis as the content is entirely based around corporate responsibility, and thus, connects with all of the different institutions and initiatives mentioned in the previous statement. It is hoped that the thesis results will be of assistance for all of these and other institutions.

1.2 Objectives of the thesis

1. To identify and characterize strengths and weaknesses of e-learning courses and techniques through literature study, and through interviews with e-learning course developers, facilitators and course takers;

2. To evaluate the World Business Council for Sustainable Development (WBCSD) and The University of Cambridge Programme for Industry's (CPI) course, 'Chronos', in a variety of ways including but not limited to the various endeavours discussed in section 1.6.4;

3. To evaluate the literature about other courses and to evaluate the experiences of developers who have worked on e-learning courses pertaining to SD.

4. To identify and develop pedagogically sound recommendations for the development and utilization of e-learning courses for SD so that such courses developed will be increasingly effective in catalysing learning, motivation and empowerment to make societal changes toward SD.

These objectives were designed to contribute to a better understanding of how to develop, utilize and evaluate the effectiveness of e-learning courses. The recommendations were designed to assist e-learning course developers to improve their courses to increase effectiveness in awareness raising, knowledge development, and motivation and empowerment enhancement so that an ever increasing number of individuals will become engaged in helping to effect the transition at the local, regional, national and global levels into sustainable societal patterns.

1.3 Research questions

1. What are the general strengths and weaknesses of e-learning courses and programs?

2. What conditions, approaches, tools, and methods can be used in e-learning courses?

3. How does Laurillard's work relate to e-learning regarding the provision of effective e-learning courses?

4. What are the strengths and weaknesses of the 'Chronos' course and how the weaknesses can be overcome?

5. What insights can be gained about the potential educational effectivity of Chronos by evaluating Chronos learning participants' experiences through the lens of the Norm Model?

6. What insights can be obtained by evaluating other sustainability-related courses that are more or less directly linked with e-learning?

1.4 Scope and limitations

Learning

The approach taken in this thesis was influenced by Laurillard's recognition that educational design cannot be viewed as a "precise science" and that methodology can be both more generative and "productive than prescriptive guidelines" (Laurillard, 2002, pg. 194, 4). Garrison et al. (2003) echo Laurillard in stating that to contribute to building knowledge "is an enormous challenge and there are no simple rules or recipes for designing and delivering an effective e-learning experience. The

complexities of context and distinct communication characteristics of e-learning to support communities of inquiry do not lend themselves to easy or simplistic solutions" (Garrison et al., 2003, pg. 7). In light of this difficulty, this thesis is not an e-learning for sustainable development 'how to' directive, so much as a collection and evaluation of key issues to consider and a general framework within which one can find guidance when revising or developing e-learning for sustainability.

While there are a variety of beliefs and theories about what is required for an effective learning experience, a number of keys for success can be found on a consistent basis throughout the literature. An example is the need to actively engage the learner, which is discussed in greater detail in section 2.1 (Laurillard, 2002, pg. 52).

Experienced educator and learning technology expert Flood stated, "(l)earning theories offer poor predictive power in terms of how learners work and learn" (Flood, 2004). Another study team has come to the conclusion,

> "that simplistic models of behaviour-types, or learning styles do not serve to explain the behaviour observed. Numerous theories of learning and practitioners posit simplistic characterizations of human learning styles (Felder and Silverman, 1987, Kolb, 1984, Rose, 1985 as cited in Waters et al., 2005).
>
> We believe that our main contribution is to suggest that these characterizations are less helpful in the context of online learning than looking at the nature of individual contributions. In an exploratory study of online learning behaviour, we found that (many or most) students appear to adopt a variety of learning roles,"…

thus making it difficult to fit all learners into a specific learning style theory (Waters et al., 2005). In light of these statements, an attempt has been made to draw upon experiences, intriguing concepts and generalizations found in the literature and in the empirical research done in the process of developing this thesis.

The scope is relatively broad, encompassing a number of learning courses and techniques that address a variety of issues that can be linked to sustainable development. While it was too complex for this thesis to address, in detail, how learning occurs, general principles pertaining to learning are discussed.

Chronos

The 'Chronos' course, which looks at sustainability within corporations, is assessed, in depth, and yet it was not possible, due to limited page space in this thesis to discuss organizational management or theory in a meaningful way.[8]

Because it is of great interest to this thesis author and since it is the central, golden thread of the Chronos course, behavioural change for the sake of sustainability is a sub-focus within the thesis.

It is recognized that the Chronos course developers state that customization[9] of the course can be important and it is preferable not to administer the course in a standalone manner (i.e. without any other supports, methods of delivery, or human interaction). Due to logistics, Chronos was the best course to be given in a standalone manner and was delivered in this manner, as well as in its generic

[8] One credible source felt that a lack of understanding of organizational change was the greatest fault within the Chronos course.

[9] Customization can range from anything such as the inclusion of the logo of a company purchasing the course to the addition or subtraction of specific content for the purpose of that purchasing company.

form. As a result, it is recognized, that because it was used in a manner that does not fully follow the developers' guidance, there are some further limitations.

In terms of the participants who took the Chronos course as part of this research, each test group had specific commonalities and variables within and between groups which impacted the scope and limitations. (i.e. age, sector, background, sex, nationality, etc.).

While other courses were evaluated, the Chronos course was studied more intensively due to its design, logistics and availability.

The research into the Chronos course was designed to provide insight into the level of effectiveness of the course, at least in the short term. Such results will provide guidelines for ways to optimize the course's customization, and will provide suggestions for improvement and design of other e-learning courses. The Chronos participant questionnaires were designed to reveal how a participant's experience and newfound knowledge may impact the *course-taker's* SD actions.

Miscellaneous
The subject matter addressed in this thesis is based extensively upon the material found in the literature and that which was provided in interviews of key individuals, such as course developers and participants who engaged with the Chronos course.

It is anticipated that results will have some value for virtually all e-learning and potentially also for environmental or sustainable development driven courses.

Qualitative research looking at such small groups of subjects over a relatively short period, as in this case, cannot predict long term changes. Furthermore, the learning process is very complicated and the author was advised to be very careful in how the process is addressed. Finally, all variables cannot be controlled. A variety of learning theories and psychological/behavioural theories were not utilized due to their complexity, and the shortness of time for the research for the thesis.

Diana Laurillard is considered a key expert in the field of e-learning with Constructivist[10] roots. Specific criteria[11] that she has developed were selected to provide an initial theoretical foundation for this thesis. Much, if not all the material drawn from her work indicates the ideal to which developers and teachers should aim, not a grouping of prescribed or absolute requirements. Her insights primarily focus on the roles teachers and students should play, and thus, do not encompass all of the valuable learning experience ideas discussed in the thesis.

A tool called the Norm Model was used in research for this thesis to assess the participants' reported SD-linked behaviour and related experiences with the Chronos course and helped to provide a theoretical foundation. A norm is an 'action directive' (Wickenberg, 2004, 103-131). In other words, it is "about guiding human actions or behaviour" (Hydén, 2004). The Norm Model, created by Håkan

[10] Constructivism has two main components: (i) "learning is an active process of constructing rather than acquiring knowledge, and (ii) instruction is a process of supporting that construction rather than communicating knowledge" (Duffy and Cunningham, 1996, as cited in Laurillard, 2002, pg. 67); This approach has typically examined the interaction between teacher and student but has failed to provide an elaborate connection "between teaching, student activity and interaction with the subject" (Laurillard, 2002, pg. 77).

[11] Including ideas such as a teaching strategy, mathemagenic activities, and other individual concepts like learners playing an active role and the need to situate learning.

Hydén, assesses norm creation and is made up of three components; knowledge, willingness and systemic conditions.[12]

In some sections of the thesis, the discussion addresses common threads that must be addressed in evaluating and improving upon diverse learning settings, goals and techniques in higher education and in life-long learning/training contexts. The author has distilled the general learning insights from each section to assist the reader to better understand the overall, broad goals encompassing e-learning and how to best proceed for making further improvements.

Key lessons from a range of courses such as The Natural Edge Project's (TNEP) 'Engineering Sustainable Solutions Program' (ESSP) and the second round (2003-2005) of developing and running the IIIEE's course, 'Introduction to Cleaner Production and Sustainable Development' (ICP) have been included.

1.5 Assumptions

It is assumed that Laurillard's concepts that were developed with the higher educational, e-learning system in mind are also applicable for the provision of learning tools for other educational and training contexts.

It is assumed that the more of the various criteria and strategies developed by Laurillard that a course meets, the better the chances that the course will help to ensure successful learning.

It is assumed that if provided with effective learning experiences geared towards SD, learners will be more inclined to behave in a more sustainable manner.

It is assumed that while different individuals, groups, contexts, etc. strongly impact learning experiences and any resulting action, it is thought that taking a more general approach to learning and e-learning, such as providing flexible strategies to meet a broad range of individuals, is a valuable decision.

1.6 Methodology

1.6.1 Initial Steps

A pre-paper was written assessing learning and e-learning, with the objective of identifying the key factors/tools/concepts/approaches which can improve and impede e-learning programs. That pre-paper used work from Laurillard and the Norm Model to perform an initial evaluation of the Chronos course.

A literature review, expert consultations and Chronos participant responses, examined general principles of learning and more particularly e-learning, norm creation, and sustainability.

The Chronos e-learning course was determined to be the best course to use for the in-depth empirical study since it was found to be the most creative, interactive course with the most suitable type of message and design.

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[12] This tool has been used since 1997/98 by them (Hydén, 1998 and Wickenberg) and was recently published in research reports and books by: Hydén, 2002 and 2004; Wickenberg 1999, 2004 & 2005.

1.6.2 Action Research and Case Study

This thesis author has taken an action research approach which typically carries two aims; "action to bring about change in some community or organisation or program, and research to increase understanding on the part of the researcher or the client, or both (and often some wider community)" (Dick, 1993). As such it becomes "research with (the stakeholders), rather than research on (those stakeholders)" (McNiff, 1988, pg. 4). This worked well with the goals and plans of the thesis. By placing Chronos into companies and questioning and/or meeting with the participants after course completion to discuss outcomes and to potentially brainstorm ways to change their and their organization's behaviour in a more sustainable manner, was especially suitable for the action research approach. This way, both action for change and an attempt to build greater understanding of designing and leveraging e-learning could be accomplished. It was especially valuable that the approach provided and facilitated "responsiveness and flexibility and action" (Dick, 1993).

Eden and Huxham (1995) discuss two ways for the researcher to go about conducting action research. One is to begin with a set of assumptions, better to be grounded in theory along with a conception of the system to be studied. Such assumptions help to direct the flow of the research. The other approach they discuss is to "repress any pre-understanding" until the later stages of the research which is meant to allow for a more open mind. (as cited in Lidgren, 2004, pg. 7) In this research a combination of these two approaches was utilized.

The following points play a role in action research and the responses which follow explain how this work responds accordingly.

- "the need for the study" (Dick, 1993). As stated, there is a great need for more study of this sort due to a failing within the e-learning field and an urgent need for our society to become sustainable.

- "the paradigm (action research)" (Dick, 1993). As has been recognized the dual purpose associated with the approach, bringing about change and gaining greater understanding, fit well with the goals of this thesis.

- "the use of qualitative data" (Dick, 1993). The material of greatest interest and which fit best with the logistics and numbers associated with this research fits with a qualitative approach.

This thesis combines both an action research and case study approach. It has been said that "case studies are 'a step to action'" (Adelman et al., 1980 as cited in Bassey, 1999, pg. 23), thus there is a natural connection to action research.

Typically case studies are meant to look at the 'why' and 'how' in a particular instance where the researcher has minimal influence over the situation, and where the researcher looks at "contemporary phenomenon" found in a "real-life" situation (Yin, 1984, pg. 13). In this case we are looking at why do learners respond to particular learning situations and methods and how can we leverage this understanding to improve e-learning which will lead to greater change for SD. Here, the researcher certainly had influence within the process. For example, the groups who engaged in the Chronos course in this research likely would not have undertaken this course, at least not at this time. However, the researcher was able to influence the participants very little beyond this (i.e. participants' backgrounds, method in which they engaged, the effort put into engaging, the personal and private conditions in which the participants could both 'situate' or consider what they were learning and then

later, how they could apply such knowledge)[13]. Providing the Chronos course to the three groups helps to place material of interest in "real-life" settings. The participants from the two companies, telecommunications and Internet-related, are able to contextualize what they are learning in the course to their personal lives, and more importantly, their company lives. The IIIEE students taking the course were able to do something similar relating the course to personal and past-organizational lives. While the connection to 'real-life' can be more abstract for the IIIEE students, nonetheless, they are hoped to be thought of as 'experts' reviewing the course rather than experiencing the course only as a learner.

1.6.3 Focus Group(s)

The Literature

The idea of a focus group is to uncover how individuals think and feel about particular issues, products, ideas, organizations, etc. A focus group typically engages six to eight individuals who share a particular characteristic that makes them interesting for the researcher to explore the issues together. However, groups as small as four and five have become more popular. They are then provided with an experienced moderator and placed in a "comfortable, permissive environment." It is important that the moderator creates a type of environment where the participants do not feel judged so they feel they can open up. As such, it is important that the moderator not have certain characteristics such as power or influence which could lead to particular types of participant feedback, whether positive or negative. Besides the participants sharing similar characteristics, a focus group provides qualitative data that stems out of a "focussed discussion" which helps those involved better grasp the topic at hand. (Krueger et al., 2000, pg. 4, 9, 10 and 73)

1.6.4 Chronos

The Chronos course, which takes three to five hours to complete, was administered to 28 test subjects[14]. All who took part were fully informed of the purpose of the study and had 'signed' a form declaring that they were aware of the initiative in which they were taking part, willingly. These test subjects primarily hail from three groups[15]: an international mix of 2004/2005 IIIEE MSc students (10 participants), a Canadian telecommunications company (five participants) and a Canadian online directory company (nine participants). Personal connections were used to recruit interested companies and students who were willing to take the course and to answer the questions.

A three-stage questionnaire (see Appendix III) was prepared for participants and was designed to help to uncover the strengths and weaknesses of Chronos and the learners' e-learning experience, but also to identify what parts of the experience are linked to potential behavioural change factors.

The three-part questionnaire began with an initial short questionnaire. Participants then answered a second round of questions immediately after taking the course and finally five to seven days after having completed the course answered the final set of questions[16]. The questionnaires were designed to assess the *course taker's* initial awareness and perceptions about environmental and SD issues, their changes in awareness and knowledge immediately after taking the course as well as assessing these

[13] In the case of the one focus group, the researcher gave additional input beyond what was provided to other Chronos research participants. For example, participants in the focus group were asked additional questions and were provided with some suggestions.

[14] With 28 participants engaging in the course and questions, this represents over 100 hours of work which is significant.

[15] Four additional subjects trialled the course and questions.

[16] Virtually all questions were qualitative.

parameters at five to seven days after taking the course. Additionally, in the later evaluation, feedback was solicited with regard to how the new understanding and awareness influenced the *course taker* to make changes in behaviour in their personal and/or professional life.

Following the collection of the responses qualitative examination was undertaken utilizing an ad-hoc hermeneutical interpretation approach, primarily feeding information into the Norm Model, a model to be discussed in greater detail in section 1.6.5. Subject responses were read multiple times and then when deemed appropriate, were systematically broken down by company, sex, etc. to assist with the analysis. Material was extracted and included in this thesis on the basis of frequency, patterns found, and what was seen to be particularly relevant and insightful. The Norm Model was used as a major focus of this thesis is to look at action and behavioural change for sustainable development. Furthermore, the Chronos course developers state that the success of the initiative will be found in the "degree of reflection", conversations inspired, and the motivation generated to take action towards sustainability (WBCSD, 2003). As such, it seemed appropriate to gear the questionnaire and the analysis towards action and behavioural change as much as possible.

Some of the Internet-related company participants were also included in a focus group. The focus group exercise was designed to gain deeper insight into the participants' experiences with the course and to brainstorm how their company could be made to be more sustainable. The focus group was followed by a final short questionnaire to help the author obtain summarizing insights into the participants' experiences with 'Chronos' and to ascertain how it seems to have impacted or not impacted their plans for changing their company.

The course creators were also interviewed, however they were not able to provide data on past course testing and past course participants.

Aside from Chronos, key facts from a range of other courses are included along with a partial analysis of the IIIEE's ICP course, primarily based upon comments from the developer.

1.6.5 The Norm Model

The Norm Model, made up of knowledge, willingness and systemic conditions, was used as an analytical tool to identify patterns in actions and norms as illustrated in Figure 1.

For someone to follow a particular norm they must be willing do so. As such, *will,* is one of the three main components. However one cannot follow a norm if they are simply willing to do so; they must also have the *knowledge* and *competence* to perform the task. Therefore, *knowledge* combined with *cognition* is the second component of the Norm Model. How one makes sense of a situation greatly impacts the result. Furthermore, the *systemic conditions w*hich surround a given situation in which one is to act on a norm set the general context and play a major role. Regardless of an individual's willingness and required knowledge, they must also have the actual possibilities available to conduct any particular activity. While the first two components of the Norm Model are directly under the influence of the individual of concern or "subjective factors", this final component, systemic conditions, is seen to be out of their control or to be an "objective factor." (Hydén, 2004) "Human behaviour on both the individual and the collective level is based on our understanding of life as a trade off, or a compromise, among these three dimensions of the norm" (Hydén, 2005). This approach assumes that individual perception is rooted in a conception of what these three pillars "imply" (Hydén, 2005).

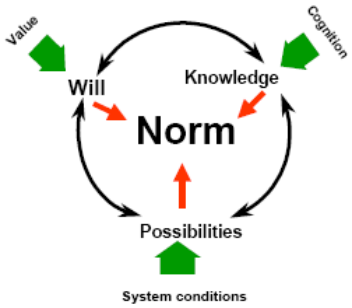

Figure 1-1 Illustration of the Norm Model incorporating knowledge, will and possibilities.

Source: Hydén, 1998

When using the Norm Model in the assessment of a norm, the typical point of departure is to begin with an action or possibly a habitual action pattern. As such the Norm Model can be used to 'analyze, interpret and understand under what circumstances the environmental theme [in question] has been established (Hydén, 1998 & 2002; Wickenberg, 1999/2004; Baier, 2003). In light of this, the use of the Norm Model in this thesis is somewhat atypical. Instead of strictly starting with one specific action pattern relating to one environmental theme, for example, this thesis author looked at a more general grouping of action patterns which were deemed to lead to more sustainable companies or societies. Through the questionnaire responses, different people in a variety of circumstances, often with corporate and/or academic experience in common, shared their experiences with the Chronos course. They discussed their personal and organisational life before and after taking this course, some based upon intended or predicted behaviour and also looking at how the course could have influenced past experience. Despite the variety of participants and the fact that there is no simple action pattern of concern, the Norm Model was found to be a very useful tool for analysing the course evaluation results. Furthermore, as stated earlier, to recognize true new, altered or changed behaviour takes more time than that which was available to perform this thesis research. Regardless, it is believed that there is value in attempting to make this type of assessment and model whatever behavioural change potential that can be recognized. Should commonalities be found across sectors and groups, they will make up the most valuable findings of the thesis.

2 Education

While the preceding chapter set up the foundation of this thesis this chapter discusses basic tenets of learning and delves deeply in to the medium of e-learning looking at strengths, challenges, and details implicated by various forms of delivery (i.e. synchronous vs. asynchronous, standalone vs. interpersonal). This chapter can help someone new to the e-learning field or someone in the process of creating or improving an e-learning program touch on many of the wide-ranging key areas which can impact an e-learning program.

2.1 Learning

According to Shirley Booth, Director of '*Learning Lund*,' Lund University, learning is the process of "sense making" or "making meaning" (2005). Such a learning process can be performed in a seemingly infinite number of ways, and for the purpose of this thesis a very broad definition of the process is used: an individual acquiring and processing information from or with an external source, human or through means such as CD-ROM, readings or internet to name three. The reason for this broadness is that different e-learning programs sometimes allow for interaction among students, colleagues and/or a teacher, but can also be self-contained or simply involve interaction between the student and the computer.

In this section the author's objective is to highlight select areas that help in understanding the learning process in order to provide guidance in the process of improving e-learning courses for sustainable development.

i) *History*

A brief review of the history of teaching is presented to assist the reader to place some recent and future developments in context. At one point it was thought that teaching was simply the 'imparting (of) knowledge." Despite evidence to the contrary an elitist higher education system was able to transfer blame upon the student with the failing grade. This approach has come to be "severely criticized" stating that it leads to more "rote memorization" and simple "surface understanding". (Inglis et al., 1999, pg. 27) There is now strong support against the 'imparting knowledge' approach. Once John Dewey rejected the classical approach of transferring "knowledge in the form of unchangeable ideas" (Laurillard, 2002, pg. 11, 12) the belief that a learner must experience active engagement for them to successfully form new ideas was established. This concept fits with the often quoted line, 'I do and I understand' (Laurillard, 2002, pg. 52). Since this perspective was introduced, many individuals including Vygotsky and Piaget have supported the necessary active requirement for the successful creation of knowledge. While these individuals have impacted education at the primary level, higher education is still frequently based largely upon the 'imparting knowledge' through lectures and textbooks. (Laurillard, 2002, pg. 12/13) In a lecture situation it is only the teacher which has the opportunity to "articulate" the thoughts that are presented. As a result the student must take significant responsibility in performing the important mathemagenic activities[17]. The point is that lecturing leads to much greater responsibility for the learner. While they can learn in this manner, they face many "opportunities for breakdown or failure." (Laurillard, 2002, pg. 92)

Besides the challenges learners automatically face in the lecture format, The Natural Edge Project has developed a set of learning materials in their "Engineering Sustainable Solutions Program" (ESSP),

[17] 'Mathemagenic' activities were originally coined by Rothkopf and are in reference to those activities that 'give birth to learning' (such as systematic eye fixations during the reading process), however; is applicable to a far wider context inferring "a student-centered approach to instruction." In other words, these are actions in which the student should engage as it is thought they can be required to learn effectively. (Laurillard, 2002, pg. 41) (Rothkopf, 1970, pg. 334).

and found other problems with teaching, at least within higher education engineering programs in Australia. The program is meant to provide a flexible set of materials for educators to use in teaching engineers in training regarding sustainability. Initially, when developing the materials the group simply "assumed that teachers (knew) how to teach." In retrospect, this has become their greatest challenge as they have had multiple requests to provide more methods and explicit techniques for delivery to assist professors who do not necessarily on their own know the most effective manner through which to deliver the material. One developer recognized that while higher education faculty may be good researchers, for example, they may not have good insight on how to successfully assist students in building knowledge. (Paten, 16 August 2005) From this single observation, of course it is not possible to draw conclusive generalizations regarding the ability of all or most university educators across different faculties and in different countries to lecture effectively. What one can learn is that we cannot assume professors know how to lecture well; this has major implications for educational design of virtually all sorts at the higher education level, including e-learning.

ii) *'Situated Learning'*
Laurillard and others believe in the importance of 'situated learning' which is grounded in an understanding that "the learner is located in a situation" and as a result whatever is learned or as a result known from an experience is acquired "in relation to that particular context" in which the knowledge was processed (Brown et al. thought as cited in Laurillard, 2002, pg. 13/14). It has been stated that teaching should discuss the material in relation to context so as to support the learner to gain "tacit" and "conceptual knowledge"; in turn, this should help them to be prepared to take "appropriate action" in the future (Inglis et al., 1999, pg. 31).

Wickenberg is a sociology of law and educational expert who also has reinforced this stance by emphasizing that "education is not to be seen or studied in isolation from its social context" (Wickenberg, 2005). According to this train of thought, while abstraction of knowledge is not impossible, it is believed that "concepts need to be grounded in experience and practice before they can be abstracted" (Laurillard, 2002, pg. 16).

In relation to 'situated learning' or cognition, the essence of the message is that context and relating education to the learner's experiences is an imperative and can complicate the educator's task to both relate lessons to the learner's experiences and relate it to their current situation. Interestingly, in a year of research focussing on online learning done by Jackson and Anagnostopolou, they found little "recognition" of the importance of the "situated nature of learning" throughout the field. What they did find was that as a learners' understanding and approach is so strongly influenced by context that whatever technique or approach is found to work well in one instance may not work in another learning situation (Jackson and Anagnostopolou, 2001, pg. 54).

iii) *Building on Understanding*
Every learning program should be built upon assumptions or recognitions of what the student has already successfully learned. Testing helps to gauge what students already know. Unfortunately, as students master the process of taking exams, which at times test memorization of details rather than challenge them to apply such information to problem-solving, they are not learning how to apply their new insights to real world problems. Should a teacher assume too much, or test the learner's understanding poorly, that teacher will later find themselves "building on sand" when trying to teach the new concepts to the learner. (Laurillard, 2002, pg. 25)

iv) *Know your learner*
This is directly linked to the situated learning and context discussion; it is essential that the teacher knows the learner. The learner's background, whether in terms of culture, age, previous work, academic experience, etc., many factors can have a major influence on the student's learning

experience. Knowing about the learner's ability and how they function in terms of working independently or in collaboration or to work visually or verbally to name four of many potential factors can help the teacher plan how to engage the learner. Finally, it is important for the teacher to gauge the learner's general approach to interpersonal activity in order to determine what to expect and how best to structure any group activities if any should exist. (Simonson, Smaldino, Albright, Zvacek, 2000, pg. 117/118) In the case of e-learning, where possible, it is important for the teacher to grasp or help the learner grasp the methods by which they learn best. Where possible the learner should be provided with alternate methods to choose the best approach for them to proceed with learning a particular lesson. Of course, if there is interpersonal interaction in a course, this will further complicate matters.

(v) Social and Emotional Factors
Boud, Cohen, and Walker have highlighted key features of the learning process. Besides those related to active engagement and situated learning that were already discussed, they detail three additional features linked to socio-emotional factors; a "holistic process", a social and cultural construct, the "socio-emotional context". For them, learning can never be stripped down to a strictly intellectual exercise as it is a holistic process. Emotions and individual will are always involved. Learning cannot be seen as something which occurs in isolation because peers and socially and culturally driven expectations will always intervene. Finally, the learner's "socio-emotional context" will always impact the learning process. This entails the support the learner receives from others and a belief that individual motivation will be just as highly dependent upon context as it is upon "intrinsic interest". (Boud, Cohen, and Walker, 1993, as cited in Alexander et al., 2001, pg. 7)

(vi) *Feedback*
Effective feedback is absolutely essential to the learner. Proper feedback should help the leaner make appropriate modifications in their understanding and in their responses to the materials they have learned. As logical and simplistic as it may sound "feedback has to be meaningful to be useful" (Laurillard, 2002, pg. 55). There are two important forms of feedback that impact the learner, intrinsic and extrinsic feedback. Intrinsic feedback is the sort which is provided "as a natural consequence of the action; the feedback is intrinsic to the action" (Laurillard, 2002, pg. 55). An example would be when one moves a mouse and sees the pointer move as a response. Extrinsic feedback, on the other hand, is more of an external comment on the situation in question. An example would be a teacher telling a student they have given a 'right' or 'wrong' answer. Of course, unless the teacher provides a more detailed explanation as to why the answer is or is not correct, they may risk the student failing to effectively learn from the situation. Regardless, with our without explanation, the 'right' or 'wrong' response helps to illustrate the concept of extrinsic feedback. (Laurillard, 2002, pg. 55/56)

2.1.1 The Basic Essentials

According to Inglis et al., all courses should provide a variety of essential features including: registration, advice, materials, feedback, a response system, assessment of the student's performance and the results of that assessment (Inglis et al., 1999, pg. 37). There is not much to discuss here, however, keeping these key components in mind while developing the e-learning course is necessary.

Flood's dissatisfaction with the use of learning style theories is evident in that he emphasizes that the different theories are "extremely limited" and often "contradictory." He compares the value of using "Learning Styles" to predict the manner in which individuals learn to "using astrological charts to make decisions about the future" (Flood, 2004). He says that we are very limited in terms of knowing how learners go about acquiring or developing knowledge. It appears that experience and research is establishing the importance of the learner's emotional response and that the learner must "feel Included, Individual, Interested and Inspired" (Flood, 2004). This helps to reinforce the choice taken

in this thesis to heavily rely upon real experience, intriguing concepts and commonalities found in the literature and through the empirical research done in the process of developing this thesis. Learner-control, to be discussed in section 2.2.1 is linked to these points Flood raises.

2.1.2 Distance Learning

Conflicting evidence has been uncovered regarding learners' demands surrounding how they wish to learn. Studies have found a common preference to learn with other learners and with a teacher, in person, while others have found increasing interest in having the option to learn at a distance (Simonson et al., 2000, pg. 5-6). Getting caught up in which set of evidence seems to be more correct is the wrong approach. Regardless of what these different bodies of evidence conclude, there are large numbers of learners who will be incapable of attending training or education courses, in person for reasons such as lack of transportation, as well as cost or time. As such, without some form of distance learning, potentially e-learning, these individuals' other learning options are rather bleak. Additionally, e-learning presents an opportunity to enrich learning which may take place solely at a distance or in combination with other methods and media; this is known as blended learning. As a result, there is good reason to move forward with research, development and effective testing of e-learning as an increasingly important learning option for societal sustainability.

While there is no one best way to design or deliver a distance learning experience it is at least known that the lecture or "talking head" approach can come off poorly in this medium (Schlosser and Anderson, 1996, as cited in Simonson et al., 2000, pg. 126).

2.1.3 Learning and Learning Loops

Single-loop learning, referred to by Morgan as 'dangerous', relies upon the recognition and correction of a problem in line with a certain collection of norms and values. Double-loop learning requires the individual to step back from the situation, not simply focussing on the problem and given circumstances, but to question the norms and values themselves which govern that system (Morgan, 1997, pg. 87). In the corporate or organizational structure, single-loop learning is not uncommon for reasons such as top-down bureaucracy. This type of approach can plague a company, 'obstruct' its ability to learn effectively, and in the end, lead to failed improvement or possibly further degradation. (Morgan, 1997, pg. 88)

Single-loop learning can also be a problem within the higher educational system. For example, the corporate community has expressed great displeasure with MBA graduates who have been unable to place what they have learned into reality due to factors such as the over-simplification of knowledge limiting them to single-loop learning. This is where double-loop learning is required if they are to get to the heart of the issues in these companies. (Morgan, 2005, August 5) Within or outside higher education, if double-loop learning is not encouraged, finding the true obstructions to sustainability, let alone solving them, may prove impossible. Of course, at some point, particularly in the initial stages of learning, the learner must be able to see and establish some principles and norms, otherwise everything they will learn will be simply 'floating around' and they will be incapable of acting. These initial phases lend themselves to single-loop learning. While it must be done cautiously, it is important to bring in double-loop learning, even at an early stage, so that the learner does not become a passive learner,[18] and so that they are capable of exercising double-loop learning come the appropriate times.

[18] Double-loop learning implies a certain degree of learner-control and is also related to soft-learning, something discussed in more detail in section 1.1.2.

2.1.4 Technical Learning

While technical learning is simpler than soft-learning, Morgan recognized that any learner, even in a more straightforward technical learning situation, could still misinterpret something and that having a live human present is helpful for assisting the learner to correct such mistakes. (Morgan, 2005, August 5) A human instructor is more capable of spotting mistakes or reworking the manner in which a concept is delivered to ensure understanding. In comparison, a computer is not as 'perceptive'. Even if a computer provided various methods and techniques for delivery of the same concept, the student may not select the method which suits them best.

2.2 E-Learning

Despite the disappointments and unfulfilled expectations surrounding e-learning a variety of drivers have resulted in significant growth, or at least, attempts at development of e-learning courses. Institutions, whether educational, corporate, or otherwise have, in recent years, faced reduced budgets for education and training (Lockwood and Gooley, 2001, pg. xi). For example, within corporations, there remains an essential need to provide effective, on-going training while individuals within these organizations face a significant scarcity of time, many pressures from downsizing and de-layering which have led to a new reality where few are provided with any additional slack when it comes to the use of time or resources. As such, taking time out to learn is now seen as a "luxury" or a "thing of the past" (Morgan, 2005, C). These same institutions are facing 'increasing competition' in many respects, including in providing good learning and training experiences. There is also a growing interest to reach out to a variety of 'disadvantaged groups' whether they are negatively impacted for personal, financial, geographical or other reasons. Finally, there is an ever present urge to provide the best "learning experience possible" whether this is in the corporate world, the academic world or otherwise. (Lockwood and Gooley, 2001, pg. xi).

Inglis et al. (1999, pg. 24) stated that while e-learning can help with education quality and in dealing with larger numbers of students, research into e-learning "has failed to find any significant difference in learning outcomes between traditional and digitally based innovations." This is certainly an interesting statement, but it is thought to be risky to make sweeping generalizations based upon such findings. Inglis et al. themselves say "that there is no single best approach to online delivery….(and as a result, the preferred approach in a given circumstance will) depend on a range of factors" (Inglis et al., 1999, pg. 33). In the same vein, so much of e-learning, in particular, and any learning experience in general, is dependent upon so many interacting contextual features. As Laurillard stated, the situated nature of learning plays a major role. What can be underscored from this statement and the rest of this section is that e-learning has the potential to provide a variety of advantages and benefits, to complement the learning process, and perhaps, to act as a valuable substitute or superior option in comparison to other learning alternatives.

2.2.1 Basics

Advantages

Inglis et al. have summarized the benefits of applying technology to learning in three ways:

a. It is 'cheaper' in reduced costs of delivery;

b. It is 'faster' in transfer;

c. It is 'better' in terms of options, interaction, etc. (Inglis et al., 1999, pg. 34-35)

This section is designed to assess what truth there is to these claims and other additional facets in order to provide a more holistic account of e-learning.

There are some basic reasons why e-learning has caught the attention of so many individuals. It has the potential to provide unprecedented flexibility in relation to a variety of key features including those in Table 2-1.

Table 2-1 Factors leading to flexibility in e-learning

Feature	Implication
Place	**So long as the learner has access to the necessary technology and infrastructure (whether it be simply a computer, electrical supply, CD-ROM, and/or and Internet connection, etc.) they then can engage in the learning process in virtually any location in or out of this world. This can mean working in a preferred location, do without transport, and avoid creating and maintaining additional central academic/training facilities. This is not to say that e-learning can or will do away with all of these central facilities, so much as increase the opportunity should a learner and/or provider choose to avoid these details.**
Time	**The learner can theoretically choose to engage in the learning process anytime they wish. Of course, this is assuming that there are no other individuals within the same program with whom they wish or must interact. Even if those individuals do exist, should communication be organized in an asynchronous manner, then the freedom of time choice will still remain. More specifically, one example of the time advantage associated with e-learning is the "just-in-time" nature of the availability of the material (Zhang, Zhao, Zhou and Nunmaker, 2004).**
Pace	**The learner will be able to spend as much or as little time on the activities as they wish and return to any sections within the program as they choose. It must be noted that depending upon how a program is constructed there will be more or less control left up to the student which will impact the pace at which they operate. For example, should a section of a course be set up in a manner that a learner cannot advance without completing certain objectives then this will clearly impact the learning experience and the pace. Of course, in the absence of structure some students may not respond well and find or make the time necessary to learn the material properly. Again, while this is a reality that must be confronted, this is not necessarily a direct failure of e-learning itself.**
Entry	**E-learning courses can be designed in a manner which allows student to quickly survey the contents of the entire course and allow them to begin at any stage of the course which means that they can skip ahead of sections which are not of interest or that they already know. The learner can also choose the level of content and levels of difficulty they wish to engage.**
Exit	**E-learning courses can be constructed in a manner which allow the learner to "dip in and out" of the course, taking different paths (perhaps externally on the internet), and complete their experience internally or externally wherever they wish.**

Materials in this table are derived from Inglis et al., 1999, pg. 18[19]

[19] This citation applies to the contents of this table except for the one point within that is specifically cited.

There are several reasons that drive interest in greater flexibility including, but not limited to the ever increasing diversity of learners within higher education, and potentially beyond (Collis, 1998, pg. 377).

The medium also has the potential to provide the following benefits in the learning process:

-provide the potential for a learner-centered environment;

-the ability to actively engage the learner with problems and tasks;

-the potential to provide interactive and responsive activities;

-provide engaging simulated or "rich environments."
(Alexander, Shirley and Boud, David, 2001, pg. 9).

Finally, there is another set of benefits recognized by Moran and O'Reilly in Table 2-2.

Table 2-2 Additional benefits of e-learning recognized by Moran and O'Reilly

Benefits	Discussion
Purposeful dialogue	**If it is attained, some see this as potentially the greatest feature of e-learning. This is never a guarantee and the wide range of potential complications surrounding this are discussed in the thesis.**
Multiple Voices	**In other media such as the traditional classroom or especially in print, there is a risk of running into a teacher-centered dynamic which can limit the number of perspectives available during the learning process. This is not to say this cannot be overcome in these other media, at least in the classroom, nor is e-learning a guaranteed solution to this, however, e-learning does have the potential to broaden the spectrum.**
Authentic Tasks	**Properly selected activities can help the learner apply what they have learned to 'real-life' situations. Again, not that this cannot be provided in other ways and always certain obstacles must be overcome, however, e-learning does present a unique avenue to provide for engagement in diverse types of activities.**
Cross-cultural dialogue	**Travelling to other locations or corresponding through non-electronic or telephonic means to interact with people of other cultures can be financially and logistically difficult, if not impossible. As such, e-learning can provide unique international interactions and forum or foundation for collaboration.**
Peer and self-assessment	**For those who cannot participate in a traditional classroom, and even for those who do, e-learning provides a unique manner in which these activities can be facilitated. For example, opinions and completed work can be posted on an online bulletin board or sent around by e-mail allowing for peer assessment. Furthermore, actually writing of thoughts and answers, by its nature will promote greater self-assessment, not to mention, the added pressure of knowing that others will be reading what is to be sent.**
Wider development of abilities	**With regard to the previous point, the medium can provide for the learning and honing of a variety of skills such as 'oral communication', 'group facilitation and decision-making', and many more.**

Materials in this table are derived from Moran and O'Reilly, 2001, pg. 185-187

Certainly, the various benefits are not always enough to create buy-in, into e-learning. The positives discussed can help with encouraging buy-in, something discussed in greater detail later in this section.

Challenges

A Lesser Library
Laurillard stated that web resources that fail to take into account various learning requirements will run the risk of being no more effective in allowing for learning than a library, and even less so should one keep in mind that a librarian can provide additional assistance (Laurillard, 2002, pg. 121). It is believed that this thought can be spread to many aspects of e-learning, thereby forcing one to be cautious when planning and designing new e-learning resources.[20] In fact, creating effective e-learning is something that is seen as more challenging and takes more time than developing a traditional classroom experience (Garrison et al., 2003, pg. 78).

Significant Shift
Moving from a traditional classroom, entailing "unselfconscious learning" that relies upon direction, to becoming a more "self-conscious independent learner" taking on a host of new burdens represents a major change. The learner must generate self-motivation where before it could have come from an external source.[21] Furthermore, the computer learning medium can be seen as "alien" to the learner. As such, it has been recognized that supporting students to learn how to learn in this new medium can have a very positive impact on the process. (Flood, 2004) This is reminiscent of the discussion of double-loop learning in section 2.1.3.

Technicians and the Public
Similar to Laurillard, Hills has highlighted the importance of the contribution made by Dewy and Kolb (1984) that a "pragmatic approach" should be taken to learning as it is believed that "experience (plays a major role) in all learning" (Hills, 2003, pg. 2). Past experience can help to 'situate' present learning. This can be challenged as on-line learning "by its nature" is typically cognitive which can lead to a theoretical approach. Furthermore, while studies have found that the majority of the population prefer using "practical" examples in the learning process, "intuitive and rational" individuals who typically work in the computer field and create e-learning programs are potentially more likely to produce conceptually and theoretically driven materials; materials that perhaps do not suit the majority of the population. (Hills, 2003, pg. 2)

Taking Diversity into Account
It is recognized that there are different kinds of learners[22], but rather than explore all possible personality and learning preference that may be associated with each group, dependent upon how they are divided, this author discusses strategies that should have broad appeal and the flexibility necessary to accommodate a wide variety of learners. Furthermore, unless a relatively large undertaking of recognizing groups and differences is executed, it seems as if this type of discussion should be taken on a 'case-by-case' basis where it is expected that the context-specific aspects will likely play a major role in the analysis and in any attempted e-learning educational accommodation.

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[20] The first attempts at e-learning strictly focused on taking content and placing it online. This has been viewed as a major error on the part of the providers, and yet, it is still done to this day (Morgan, 2001, B). This is very much in keeping with the library comparison.

[21] Of course, this will depend upon the nature of the e-learning structure and the degree of inclusion of interpersonal interactions.

[22] This is accepted at the individual level but has also been hypothesized in relation to national, cultural, and geographical aspects (Hills, 2003, pg. 19). It is recognized that this is extremely important to the development of e-learning and in the communication, understanding and implementation of sustainability. However, these differences are not specially addressed in this thesis aside from the present discussion about providing learner-control, flexibility, and creativity in an attempt to successfully connect with greater numbers. Of course, it could also be that e-learning, by its very nature, could be incongruent with various groups regardless of the effort put into these three strategies. For example, different countries within Europe have achieved dramatically different rates of internet use per capita (Hills, 2003, pg. 19). Again, while access and technical issues are important to e-learning development, and at times can divide the world between the wealthy and those less fortunate, these issues are not addressed in this thesis.

Some have said that while we are all unique and there are different kinds of learners, e-learning has appeared to typically provide a 'one size fits all' solution. Hills recognizes that this oversimplification can be alleviated through improved flexibility brought about by the incorporation of human interaction (Hills, 2003, pg. 6/7).). He is not wrong in his statement, but fails to register the other forms of flexibility that e-learning can bring, such as greater learner-control and variability. Besides the addition of human interactions, flexibility can be introduced through, but not limited to, expression of a particular concept in different ways (i.e. pictorially, through analogy, etc.) or in the manner in which the student is asked to work through a problem (i.e. situating the concept in the learner's current experience/understanding, etc.).

Learner-Control

Learner-control is an important feature to be designed into e-learning and is a central theme that is addressed throughout this thesis (Morgan, 2001). Examples of this would be to facilitate the learner's active construction and testing of their understanding as they go through the process. Also, the learner needs to have an opportunity to create 'strategies' that let them become aware of what it is they comprehend and where they may need to put in further effort to improve their understanding (Bransford, Brown and Cocking, 2000 as cited in Waters and Gasson, 2005). Baynton (1992) has stated that learner-control is not simply greater "independence" for the learner, but is something that is impacted by the learner's "competence (ability and skill), and support (both human and material)" (as cited in Williams and Nicholas, 2005). Sequencing, decisions left to the learner, allowing for the speed and number of times the learner wishes to access ideas or sections of the material, allowing the learner to seamlessly navigate between the program and the outside world (i.e. the Internet), and allowing the learner to choose the method they wish to use to learn a concept are all examples of how to improve learner-control.

Typical Behaviour

An e-learning program can be set up in a manner by which the learner must provide the correct response before moving on in the program. This is one example where the developer or teacher opts to exercise greater control and/or could feel the learner needs to master certain concepts, etc. before moving ahead. Caroll found that being compliant under these conditions, is not how learners typically respond. "From the very start, adults have their own agenda, they want to take their own actions, frequently short-circuiting training material, jumping about within it and simply failing to behave in ways that the designer expects". (Caroll, 1990, as cited in Hills, 2003, pg. 80, 82) This comes back to the original suggestion to make materials geared towards facilitating greater learner-control. Of course, this can leave a teacher with the dilemma of allowing for this learner-control, and yet, still ensure that the students get the experience or components of the program they wish them to receive. There are different techniques a teacher or organization can utilize. First, they present a list of expectations which can be as general or specific as they wish. Learners can be asked to look for particular elements, summarize what they have learned, or be tested during or after the e-learning experience.

Hills underscored that the e-learning course designer should work on the assumption that the learners will respond to the program in a 'random' manner, and once this is taken as a given, the course takes on more of a 'knowledge management' appearance. If the learner's actions are deemed unpredictable, then it is sensible to design particularly "small-contained units" of content. These units are sometimes seen as providing "byte-sized learning." This provides a simple concept for design, but something that can be difficult to actually deliver. (Hills, 2003, pg. 84)

Caroll sketched out a variety of techniques to help cope with 'typical user behaviour,' including:

- start the learner with meaningful tasks;

- use task-oriented guides with little explanation (as brief as possible);
- never patronize;
- develop application software…(so) that learners can complete real but simple tasks;
- allow learners the opportunity to annotate and personalize their learning material;
- design all material so that learners may use it in any order;
- build on the preconceptions that learners bring to the learning task. (Hills, 2003, pg. 96)

Even if the learner is to attempt to follow the intended path laid out by the e-learning course designer, they can still fail to comply for a variety of rational reasons, which seem to be out of the learner's control. Should a program 'cross the line' the learner can feel patronized and could very naturally become upset and respond in what could be interpreted as an immature manner (Hills, 2003, pg. 83).

Quantity of Content

'Building courses or entire curricula' is challenging when the developer is both compelled to increase and decrease the amount of content. They will push to increase content by including links to outside sites that could be seen as valuable, along with supplementary material. They wish to decrease content as "if there is to be considerable interactivity (and) repurposing lecture notes…reducing the quantity of material presented cannot be ignored". (Garrison et al., 2003, pg. 67) Furthermore, if 'higher-order learning' experiences are sought, "then students must not be overloaded with excess content" (Garrison et al., 2003, pg. 82/83). Of course there is a difference between simple reduction of excess content and stronger efforts to reduce content, however, the overall pressure for a reduction is very much in place. In fact, teachers may find themselves having to "throw out" material that they would otherwise include in a traditional classroom experience (Simonson et al., 2000, pg. 119). Quantity of content is also related to the manner in which the material is presented. It seems likely that a learner will more easily come to watch a video clip as opposed to read an entire section of text which covers the same amount of material.

Communication

In the mid-90's, early in the e-learning field development, it was thought that its creation was so exciting that people would be thrilled to engage in it. This was clearly not the case at all. (Flood, 2004) Caroll commented that just like every other "new thing", e-learning at least 15 years ago, was over-hyped. This led to unrealistic expectations which resulted in difficulties that the learners tend to blame on the program as opposed to themselves" (Caroll ,1990, as cited in Hills, 2003, pg. 80, 82). Interestingly, while Caroll's comments were recorded 15 years ago, during research for this thesis communication issues were found in the case of one current e-learning course which led to unfulfilled expectations (Madden, 2005, B). While this current case may not be linked to over-hyping per se, these unfulfilled expectations led to learners directing their discontent at the program or the provider, not themselves. Flood (2004) stated that organizations releasing programs either internally or externally must engage in "marketing", provide supports, and use incentives and rewards. Finally, accurate expectations need to be developed in the process.

Technical Problems and Support

In terms of technical problems, it has been seen that learners often blame themselves and that this can damage their confidence. As such, it is imperative that a program and technical situation be well prepared and that a reliable support system be put in place for both technical issues and any other

problems. (Flood, 2004) So, whether unfulfilled expectations lead to blaming the program or other problems lead to the learner blaming themselves, any of these scenarios result in a less effective, if not, failed learning experience. The culture of an organization implementing e-learning also represents an important form of support. As such, a supportive culture along with leaders who have strong facilitative abilities is essential (Flood, 2004).

Buy-In

It can be difficult to get any organization, whether it is corporate, academic or otherwise to take on an e-learning program. As such, there are a number of factors, presented in Table 2-3 which can be used when attempting to get an organization to buy into a new e-learning program.

Table 2-3 Factors to improve organizational buy-in into e-learning

Feature	Impact
Relative advantage	**The 'perceived' and true cost-benefit will influence the uptake.**
Compatibility	**The more easily a new technology or program fits with "existing values, beliefs, experiences and norms" the quicker it will be adopted. Robinson fails to mention that the more easily a program can be customized, the easier it will be to fit in with an existing organization.**
Complexity	**The more challenging a new development is perceived to be the slower the uptake will be.**
Trialability	**The more easily the program can be tested the more willing people will be to engage. Also, the more the program can be broken down and delivered in smaller pieces the easier it will be to carry out the experimentation.**
Observability	**The easier it is to see the results of the new program the easier the sell will be.**

Materials in this table are derived from Robinson, 2001, pg. 24

Costs

Costs are a difficult detail to address with any absolute certainty when discussing e-learning, in general terms. E-learning, no doubt, presents a possibility for great cost savings as many have touted, however, this does not tell the whole story. While a school can reduce significant costs by avoiding building new facilities, this is not a guarantee that the e-learning option will be cheaper. There are thoughts that once enrolment numbers hit a critical level, which is entirely in reference to each program and school, etc., that at that point, significant costs savings can be seen through developing e-learning as opposed to running traditional classes. Depending upon what is to be created, e-learning construction and facilitation can be very expensive. The key is for every prospective developer to perform a full cost analysis weighing all the options and details and only then will they be reasonably able to judge whether or not an e-learning option is financially preferable for the institution. (Inglis et al., 1999, pg. 24)

Interestingly, while not simply related to cost, it is not uncommon for the more effective delivery technologies to be seen as more low-tech or less "glamorous" due to their more reliable nature and competitive pricing (Inglis et al., 1999, pg. 38).

2.2.2 Standalone Delivery

A standalone learning product places the individual learner in contact with the computer program and no outside individuals. This approach is seen to be beneficial when:

- a large target market exists;
- flexibility is key;
- the learners' characteristics are known;
- trials are possible;
- the target learners have other materials and/or facilities to draw upon. (Inglis et al., 1999, pg. 95)

While it is imperative to know both the needs and prior understanding of the learner, it is difficult to design a course and to include activities and techniques which will please and challenge all of them. As such, the provision of different options, leaner-control, trialling and ability to revise the product, all play major roles (Inglis et al., 1999, pg. 94).

Substituting the Teacher

A teacher who is "knowledgeable and enthusiastic" can, as a result be "easy to listen to." While a human teacher is not involved in a standalone course, it has been suggested that e-learning should attempt to mimic this same relationship to improve the learning experience and that "material which entertains and excites also motivates" (Hills, 2003, pg. 56). To meet these goals various techniques can be exploited:

(i) Humour can be used as it is seen as a method of creating an emotional response that can be tied to making the learning experience more memorable. Simultaneously, "humour does not lend itself to repetition" (Hills, 2003, pg. 56), and yet, the ability for learner-control repetition is a benefit of e-learning. As such, it is important that when humour is to be invoked in a given program that it is sequenced in a manner that the learner can bypass it while accessing any part of the course again in the future (Hills, 2003, pg. 56). It should also be noted that humour can be "lost" during asynchronous and/or text-based communication (Simonson et al., 2000, pg. 134).

(ii) Games or simulations can provide for excitement by increasing interaction. While it can be tricky, games must be designed to be "sufficiently engaging, and yet, "not all-absorbing" as this could detract from the learning experience (Hills, 2003, pg. 57).

(iii) Materials that engage the senses through making "full use of visual imagery to carry meaning and delivers an aural stimulus is more easily remembered" (Hills, 2003, pg. 17).

Visual engagement

> "It has been said that we remember 20 per cent of what we read, 30 per cent of what we hear, 40 per cent of what we see, 50 per cent of what we say, 60 per cent of what we do and 90 per cent of what we see, hear, say and do (Rose and Nicholl as cited in Hills, 2003, pg. 71). The actual percentages vary with different sources. The principle seems to be universally accepted. Research on visual memory produces some very sound evidence that most of us have an exceptionally accurate visual memory" (Hills, 2003, pg. 71).

While the real world provides a variety of opportunities to stimulate our various senses, in turn, impacting upon our "thinking and feeling," e-learning can be seen as providing a "thin experience" in this sense. For the most part, even the most advanced e-learning experience will only engage two senses, the visual and the auditory. While surround sound or the use of headphones can help to stimulate the learner, the visual aspect will be limited by the size of the screen. Regardless, a number of "very simple ideas" can make an experience stick in the mind far more than a simple textual layout. "Distinctive colours, clear diagrams and some pictures" along with a good use of sound can help to improve the situation. (Hills, 2003, pg. 57) Something which is more complicated can be the provision of video. Video can be simple to create conceptually and have a strong positive impact, and yet can be challenging to deliver for a variety of reasons (Hills, 2003, pg. 71). While well designed visuals can have a strong impact on the learning experience they are often misunderstood and typically ignored by many e-learning creators (Flood, 2004).

When providing visual or other stimuli, one must be careful as a stimulus that increases one person's interest may turn another off from the exercise. This again, is where knowing your target group and trialling can help with design. Finally, while the first attempts at e-learning often relied upon simple text-based materials, there is no good excuse for these or any future programs to fail to enrich design with the use of visual stimuli. (Hills, 2003, pg. 72)

Social Issues and Standalone Delivery
These four points focus upon various intersections between social issues and standalone delivery:

(i) Undivided Attention
When a learner interacts with a stand-alone e-learning program they have virtually the entire experience carried out in reference to just them, the individual, and no one else. Of course, the degree to which learner-control has been programmed into the course will impact this relationship, however, unlike in a traditional classroom setting, the provider/program or substitute for the teacher will not have to accommodate a variety of individuals simultaneously demonstrating a definite advantage. (Hills, 2003, pg. 61)

(ii) Emotions
Interaction with other people whether they be students or teachers provides an array of benefits. Such interaction helps to satisfy the learner's emotional needs. This interaction is connected with "motivation, a sense of understanding our needs, encouragement for development and, of course, praise for our achievements. Self-sufficiency (is also)…necessary[23]…however, people still need some reassurance that they are successful, that they are doing the right thing and doing things right" (Hills, 2003, pg. 45). If well designed, a standalone course, while limiting some options, can be created in a manner which will communicate with the learner, ensure their sense of doing the 'right' thing, and attempt to provide encouragement. Of course, while doing this, a balance must be struck in providing the greatest learner-control possible and there will be a challenge in the provision of encouragement that is meaningful for the learner.

Excitement, specifically, is an emotion which plays a key role in learning. This "emotional drive" can come through interacting with others involved with the course. For example, this can lead to a sense of responsibility in not wanting to be seen as the 'weak link' in the group that fails to meet group expectations. It is believed that it will be more difficult for computers to help create this type of excitement or drive. (Hills, 2003, pg.45)

[23] Notice the connection to learner-control.

(iii) Recognition Abilities
Computers are not as capable as humans when it comes to both recognizing and understanding human behaviour. For example, a computer will not be able to see a facial emotion and respond in an appropriate manner. However, a human can misinterpret signals and respond in the wrong manner, which can in comparison to a computer be worse, as everyone expects the computer to provide the same type of response while the human should know better. Cultural differences can also cause problems in this regard. (Hills, 2003, pg.45-46)

(iv) Blended Learning
If it is seen as reasonable regarding time, location, and cost, it can be good to conduct specific learning activities which are better run in person, in a 'face-to-face' environment as part of an integrated learning program that involves e-learning (Garrison et al., 2003, pg. 54). While e-learning can be used in a multitude of ways, Morgan (2001) notes that it can be very valuable when used in "before and after education" to name one example.

2.2.3 Online Human Interaction

Community is seen as something that can be very important in a learning situation, if community, and its prerequisite, human interaction, is possible (Garrison et al., 2003, pg. 48/49). More specifically, as different learners learn differently, some on-going teacher-learner interaction should be built into the program, if possible, as this allows for greater accommodation of different learning styles (Inglis et al., 1999, pg. 31).

There are three advantages for providing for the facilitation of human interaction in a course. All participants have the ability to respond in a more flexible manner and act as resources for one another. This also allows the learners to gain greater understanding of one another's individual understanding. (Inglis et al., 1999, pg. 96)

Clearly, building up effective human interaction and learning community in an e-learning situation is not always possible and can, at times, be entirely impossible should a learner be strictly interacting with a computer. As a result, course designers must do their best to see if or how to optimize the online community building process; if not, then they must put their best foot forward in substituting for this important aspect.

Online, human interactions, can take place in two ways, through synchronous or asynchronous communication. Synchronous communication is that which occurs with all parties participating at the same time or in 'real time' and asynchronous is the opposite, where the various parties participate at different times. Examples of synchronous communication would be a conference call using telephones or 'real time' video chat. An example of asynchronous communication would be students 'posting' messages on an e-mail listserve at varying times. Both synchronous and asynchronous communication can be text-based as some could chat in 'real time' through typing (i.e. synchronous) in a program like MSN Messenger. Communication would be asynchronous, if for example multiple parties were to record and leave the messages for one another at different times through text, video, etc. Harasim stated that a "collaborative and asynchronous" approach appears to be surfacing as the "dominant model" (Harasim, 1999, as cited in Waters et al., 2005). Regardless, there is good reason to examine the various potential combinations including synchronous, student and computer, and non-collaborative models too.

Benefits of Asynchronous Interaction
While some of the benefits of synchronous interaction are more obvious, and there are difficulties to be discussed with both forms of interaction, asynchronous communication does provide various

benefits. It allows everyone to contribute at the best time for them. When confronted with a face-to face or traditional classroom context, there are a variety of reasons why a person may not engage. They may be "reflecting, distracted…fearful or angry." (Hills, 2003, pg. 63) As such, asynchronous discussion can help with these types of issues.

Regarding the asynchronous and/or text-based option; this could also be seen to provide less extraverted learners with an environment that helps to create a more equal balance and level of participation amongst the group of learners (Rourke and Anderson (in press) as cited in Garrison et al., 2003, pg. 49/50).

Synchronous and Asynchronous E-Learning System Challenges

While some "carefully constructed interactive environments have resulted in disappointingly low levels of interactivity…others have taken off, only to lead to tension, argument and discord" (Murphy, Walker and Webb, 2001, pg. 5). The author now reviews examples that illustrate these possibilities.

Social Cues

Initially, when it was recognized that e-learning holds the potential to facilitate interpersonal, interactive learning, the focus moved to the opportunity to replicate the traditional classroom experience. According to Garrison et al. after some time it was realized that creating community learning based upon asynchronous, text-based communication actually represents "a qualitative shift from that of a real-time, verbal, face-to-face mode of communication" (Garrison et al., 2003, pg. 48). Attempting to create a functioning learning community when no visual cues besides words or images are available, presents a significant challenge (Garrison et al., 2003, pg. 48). In fact, the "non-verbal communication cues" are thought to be "crucial" in the formation of "collaborative relationships (Garrison et al., 2003, pg. 49). They are not wrong that this first asynchronous option can be difficult. However, they fail to take into account the opportunity to take advantage of facilitating other options such as real-time and/or visual communication. Furthermore, in situations that require non-verbal communication, students have been seen creating a sense of familiarity, that would normally be more automatically established verbally or in person, by utilizing "greetings, encouragement, (and) paralinguistic emphasis" to name three (Rourke and Anderson (in press) as cited in Garrison et al., 2003, pg. 49/50).

While there are these examples of overcoming obstacles surrounding the lack of social cues, this same obstacle can be particularly difficult during an argument and/or during an exchange where at least one party perceives the exchange to be inflamed. In a traditional classroom, visual cues can lead to lower levels of misinterpretation. "Body language can soften the severity of the spoken word". (Robertshaw, 2001, pg.19) Seeing another's reaction based on facial expressions can help others recognize what they have said has been misinterpreted (Robertshaw, 2001, pg.19).

Despite various concerns put forward, such as the lack of social cues and others, which could harm online interaction, one provider and research found that the learners did not raise concern over "asocial, terse, (or) hostile" communication conditions. Instead, they found learners more typically are unhappy that the discussion was "too social, too polite, not critical or challenging, and thus, not a productive learning experience" (Rourke, 2000, as cited in Garrison et al., 2003, pg. 53). Learner response will likely vary, and no guarantees can be made at how successful a teacher can be in dealing with this, but a teacher who is an experienced facilitator may be able to help strike the right balance in this situation 'nudging' learners along to a point where a valuable interchange of ideas occurs. Perhaps, they can set the tone by asking the right questions, prodding the right people, and if things were to go too far, to help keep an individual in check. Despite managing a semi-functioning

discussion group, another online class that made efforts to find the right balance, still wound up with learners who felt uncomfortable sending e-mails to "faceless" classmates. (Tarbin and Trevitt, 2001, pg. 70) Perhaps this could have been solved by greater use of video, more of an effort to have the students initially simply get to know one another, or simply to use photographs of the different learners.

The learner's other side
In a traditional classroom, there are many who may feel intimidated and who temper what they choose to say and how they say it. Electronic communication can allow learners to feel more 'protected' and bring out another side of them. They can be willing to say things and to communicate in tones they would never consider if they were facing the group in the same room. (Robertshaw, 2001, pg.19)

What is in a name?
Related to the previous point, it is not uncommon for online participants to use aliases when acting or communicating online. As such, this is yet another protective barrier that can allow for uncharacteristic, aggressive or less tactful interactions. Interestingly enough, should the learners come together at the same physical location, they may be unaware of who is who, in terms of their alias' and can behave entirely differently under such circumstances. (Robertshaw, 2001, pg.19) Depending upon the circumstances, this challenge can easily be overcome by ensuring the students get to know one another so they know who they are dealing with when online.

More difficult to lead
The authority of a teacher or educational leader can be significantly reduced when communicating online. For example, they can change from a charismatic individual leading a classroom of learners to a simple nickname on a screen. Such a lack of presence can degrade their legitimacy and increase the potential for the learners to behave in a less constructive fashion. (Robertshaw, 2001, pg.19)

Role of the Teacher
While there are unique tasks for a teacher to undertake while overseeing an e-learning course, many features of the traditional classroom role remain, such as, setting "clear expectations, creating "critical discourse" and providing a "diagnosis of misconceptions". They still must act as a "subject matter expert, an educational designer, a social facilitator, and a teacher". (Garrison et al., 2003, pg. 65) The difference Garrison et al. note is that the e-learning framework strongly impacts the manner in which these duties are performed. What is required is a teacher who has particular expertise and is capable of providing the necessary presence (Garrison et al., 2003, pg. 71).

The creation of a "space" for online discussion has, at times, proven to be ineffective at fostering discussion or debate. For those leaders involved in these circumstances they have found that an on-going, concerted effort must be made to help foster communities and to oversee activities should there be hope for a regular, ongoing communicative interaction to be sustained amongst the learners. (Gunawardena, Plass and Salisbury, 2001, pg. 42) "Just expecting students to start debating online is like putting students into an empty room, closing the door and telling them to get on with it! They need some direction…" (Fox, 2001, pg. 58). While these problems cannot necessarily be expected with every 'class' it should be factored into the preparation and budgeting of time and effort through the course of a program that is designed to incorporate such interaction. Some ideas that have been used to deal with this issue are to provide some structure, incentive in the form of grading, and the raising of key stimulating issues (Fox, 2001, pg. 58). Simultaneously, you have to be wary of potential outcomes should you try to foster such discussion. One of many potential pitfalls is that the approach

could lead to too much input by too many people who are not actually reflecting on what everyone else is communicating (Tarbin and Trevitt, 2001, pg. 68).

While there are clear benefits to the institution of a human teacher or tutor for a particular e-learning course there are a number of new challenges that come along with this. If there are to be inter-student discussions, whether synchronous or asynchronous, the teacher will have to play a much more involved role than if they were overseeing a traditional classroom discussion, without becoming too dominant (Hills, 2003, pg. 63). Whether the teacher is busy ensuring that all have a fair chance to participate or that discussion remains relevant and appropriate, supervising or policing can take a great deal of time and requires a capable individual. These tasks may sound very similar, if not identical, to those performed by the teacher in a traditional classroom setting, however, it is quite different when done electronically. It is very different looking at and listening to multiple students who are present on a computer screen compared with looking around a classroom. During synchronous discussion it can be a challenge to ensure only one person speaks at a time and to facilitate the flow in the conversation. (Hills, 2003, pg. 62) When it comes to asynchronous communication depending upon availability, frequency of message postings, and the nature of the students and the material discussed, supervision of this type of communication could become a 'round-the-clock' job.

It is not difficult for one learner/discussant to 'take over' a discussion space either with a single topic of their choice or with and topic or approach that causes discomfort amongst the other learners (Fox, 2001, pg. 59). As such, a moderator must stay on top of the discussion and carefully and tactfully ensure balance and widespread participation in the discussion without losing the learner-centered approach (Fox, 2001, pg. 59-60). Again this helps to illustrate how, even if an online discussion goes well, perhaps even too well, this can become a "monster" taking up large amounts of the moderator's time. The case this is in reference too found the moderator eventually breaking up the learners into groups and appointing leaders amongst the students (Fox, 2001, pg. 59-60). This approach may not always be possible, and if it is, the teacher must be careful that they are not simply shirking their duties, leading the course away from an individual learner-centered approach as each student-leader can, in actual fact, take over their group, and finally, lose touch with the class itself.

Text-based discussion is seen as particularly 'reflective' and 'rigorous' and as a result, requires the teacher to play a key role; otherwise, "serious problems" could occur. Discussion is at risk of taking a monologue format to which learners, at large fail to engage with, or information can become a "disorganized" mountain that will be a burden to the learners. These pitfalls and others can take the interactive e-learning feature meant to build community and lead it to a social breakdown. (Harasim et al., 1995, as cited in Garrison et al., 2003, pg. 69) A teacher must be sure to follow all postings and keep in mind both the approach taken with and the timing of the responses they make. "Too little or too much teaching presence may adversely affect the discourse and the process of building understanding." (Garrison et al., 2003, pg. 69)

Teacher Control vs. Learner Control

This type of teacher-control, in the previous section, brings us to another problem. As has been said, it is very important to make an effort to make the learning experience as learner-centered as possible. Obviously, the more a teacher must intervene, the less learner-controlled the situation becomes. Ultimately, this scenario will boil down to the manner in which a variety of issues settle and interconnect such as the learners' ability to and willingness to participate in e-communication, the medium of communication used, the timing, the nature of the subject and of the learners, etc. In each case the teacher will have to at least take an initial leadership role and observe the group interaction throughout the course, interjecting where necessary.

In any learning scenario disagreement is bound to occur and should, to some degree, be encouraged. The key is to both generate trust while maintaining "respectful" criticism. (Garrison et al., 2003, pg. 80) One way to help with this is to establish a set of rules and decorum to be following in the program. For example, learners should be aware of how to, how long, and how often they should be contributing. (Garrison et al., 2003, pg. 81) Of course, this once again clashes with the interest in maintaining a learner-centered approach. Establishing a thriving social environment is a major task for the teacher. Garrison et al. suggested five ways in which a teacher can achieve this:

- shape discussion but do not dominate;
- provide feedback with respect;
- be constructive with corrective comments;
- be open to negotiation and providing reasons;
- deal with conflict quickly and privately. (Garrison et al., 2003, pg. 89)

2.2.4 Social Impacts

Hills identified several ways in which learning is impacted by social factors that must be reckoned with when developing and running e-learning programs. Two of these are discussed in the following paragraphs. (Please see Appendix IV for additional points raised by Hills.)

(i) Asides

Asides occur when learners interact outside of the formal educational structure or format with one another. Hills talks about the significant difficulty that can exist within an e-learning course to allow for asides. He states that the most frequent solution is the creation of a chatroom which he sees as a potential location where the participants are unable to know if others are there listening in (Hills, 2003, pg. 62). Hills fails to see that the widely used online services which are free of charge, such as 'MSN Messenger' and 'Skype', which provide for voice, text, and video chat that could be used very easily to accommodate for such asides. In fact, these online services already provide, not only for simple asides between students who are in a traditional classroom, but allow for additional asides to take place in the actual traditional classroom. Before these services were available, options for asides during class were limited. So, in fact, these services have bolstered the potential for asides before students even began using them within the e-learning medium.

(ii) Incidental learning

This type of learning can be explained as a "by-product of some other activity" and seems to arise more easily in the traditional school setting. Hills says that if conversation is meant to lead to incidental learning then those conversations must be natural and free flowing. Instead, he talks about how a standalone e-learning course can only be programmed in a manner that makes it more of a search engine than something that provides for actual conversation. (Hills, 2003, pg. 64/65/66) He is quite right in recognizing this major drawback of a standalone course as artificial intelligence has not yet reached a point within e-learning to get around this challenge. He emphasizes the fact that e-learning provides a unique experience regarding incidental learning, in that no other medium places the learner so close to "billions of documents (which) are just a click away" (Hills, 2003, pg. 67). What Hills fails to discuss is that just as conversation can be facilitated through various means, as discussed above concerning the asides issue, a similar approach can be taken here should their be other individuals engaged in the program.

2.2.5 Feedback

As recognized by Laurillard, quality feedback is essential in the learning process. However, depending upon how an individual responds to different forms and sources of feedback, that learner may find themselves at an advantage or disadvantage while taking an e-learning program. The teacher who is capable of adapting feedback appropriately, depending upon the nature of the learner and the circumstance is likely to be at an advantage. Of course, if the teacher is working through electronic communication, they may have trouble reading the situation or regulating the feedback in the best way. Of course, some teachers are not able to vary their feedback accordingly, in person or not, and as such, the "impersonal nature" of the computer may be more comfortable for some students in some conditions (Hills, 2003, pg. 47). The learner can respond to feedback in three ways:

1) They can accept the feedback, and yet, fail to have the will to change. In the most extreme cases, this can lead to a feeling of sadness or depression;

2) They can find themselves in a state of denial, which, in the most extreme cases, can lead to feelings of anger;

3) They can gladly accept the feedback and be willing to improve their actions.

In most cases, learners will steer "a favourable course" between anger and despair. (Hills, 2003, pg. 47)

Feedback and Response

It should be noted that regarding human behaviour, it has been seen that the "emotional response takes precedence over the intellectual response"[24] (Hills, 2003, pg. 47). While a human tutor can potentially respond to these emotions in a tactful manner, Hills says that e-learning "is less likely to generate strong emotions in a learner," inferring that the tutor themselves could be a source of a learners negative emotions. He continues saying that e-learning feedback can be provided in a "highly factual (manner) and neutral in tone." It is thought that as computers are void of a personality then they lack any personal qualities which could clash with the learner (Hills, 2003, pg. 56, 69). This is not so much a reason why e-leaning is better than traditional classroom learning, as is not being claimed here, so much as an aspect which could, depending upon the exact situation, play to the advantage of an e-learning format.

Regarding feedback, and tied to emotion, the 'further' the individual providing the feedback is from the learner, the less likely that the learner will be to value that feedback more highly. Furthermore, computer provided feedback may only be taken seriously if another individual will be made aware of the result the learner registers. Some learners are afraid to make mistakes, and if the feedback is provided in a strictly personal or at least, more discreet manner, the individual may be more willing to engage, and possibly push themselves and their learning further. This 'upside' is not entirely positive. If there is a lessened feeling of pressure surrounding getting the wrong answer, there will likely be a reduced "feeling of success" should the learner complete the task correctly. (Hills, 2003, pg. 51) With a lesser "feeling of success" comes decreasing motivation to take part in the first place.

Even if quality feedback has been provided, the learner sees what to do differently, and even takes the initial mental steps necessary to bring about corrected or improved behaviour, they may still have trouble leaving behind old behaviour and may require assistance in passing by this 'emotional barrier'. This can require more counselling than teaching. This is another place where the computer is going to

[24] Perhaps this is not always the case, but certainly emotion plays a strong role in human behaviour.

have a hard time substituting for a person. It is recognized that different people respond differently to the errors they make and the changes they require. As such, it is hard, if not impossible, for a computer to accommodate. (Hills, 2003, pg. 54/55) Perhaps, showing clever ways how others, especially other key individuals, such as those within the same organization as the learner or someone external that the learner respects and admires, have overcome the mistake, may help.

Miscellaneous
Hills states that basic feedback on the "lower order cognitive skills" can be provided. He mentions that simulation activities are positive in this respect. However, he continues that higher order cognitive skills, such as synthesis or evaluation, must be provided by another human. Finally, he states that at times through computer recording, self-observation provides another option (Hills, 2003, pg. 56). While he is generally correct on all accounts, his strict treatment of 'more complex cognitive skills' is perhaps, too harsh. Should an e-learning program incorporate other human interaction, they can obviously provide this type of feedback. In the case of a standalone course, things like synthesis and evaluation can be pre-designed into the program. For example, the Chronos course has participants respond to questions, indicating their values, and culminates with graphing the participants' position on a two-axis graph (i.e. social concern and environmental concern) visually illustrating the learners position, followed with feedback broken down into various categories (WBCSD, 2003). While this has taken place within a pre-defined set of boundaries, a relatively high degree of flexibility exists for the learner and there is no doubt that this process demonstrates some form of synthesis and evaluation which provides an interesting and interactive learning experience for the participant.

Moving away from issues of feedback, providers, teachers or organizations administering the course may have interest in tracking and assessing learner performance. As such, it could be difficult to strike the right balance when it comes to giving the learner the most space and comfort possible while wishing to get the information and judgement they wish to have. First, the superiors' objectives must be reviewed to see what kind of tracking and assessment is necessary. Next, simply the timing of tracking and assessment could solve the issue. For example, students could be allowed to engage for a certain period without being 'watched' to then be 'tested' at a future time, giving the leaner the space and time to take their chances and hopefully master the information, etc. (Laurillard, 2002, pg. 42). Of course, other creative forms of tracking could be used such as games and interaction which manage to evaluate the learner's performance without necessarily indicating or generating feedback which is 'right' or 'wrong' but simply more of a reflection.

2.2.6 Program Evaluation

At this stage, one must be mindful of whether or not they are more interested in evaluating the learners experience and results or the course and techniques of the e-learning tools themselves. This may sound like a simple distinction, however, it is very easy for there to be overlap between these two objectives. When seeking to evaluate a program, there are a number of questions Inglis et al. (1999, pg. 123) have posed that need to be answered, including:

a) **"What to evaluate?"** Is there interest in the number of participants a course has attracted or is it more important to know the number of cans the learner has recycled as a result of taking the course.

b) **"When to evaluate?"** Is there interest in running evaluation activities during the course, or should such activities only be run once the course is complete. Typically, a formative evaluation or one that takes place during the learning process is often associated with identifying weaknesses or making improvements while a summative evaluation or one that

takes place at the end of the learning process is often associated with finding the value of the overall course or experience. (Simonson et al., 2000, pg. 190) Some authors have emphasized that if the learner's experience is of interest it can be good for the learner to complete at least a full task before assessing that experience (Laurillard, 2002, pg. 42). This same logic applies to wanting a learner to complete a full section or whole course before assessment. Of course, this may not fit with evaluator's timelines and/or a course may simply be very long and it may be important or necessary to run evaluations before the learners have finished all of it.

c) **"How to evaluate?"** There are a wide range of options open here whether you are considering the actual tool such as surveys or interviews or if you are to gain a detailed understanding of a particular technique in which case the use of expert input could be helpful.

d) **"Who should evaluate?"** This again depends on various factors. You can simply have the learners perform a self-assessment or peer assessment whether on their abilities or on the course itself. Of course, many others can be involved as well, whether they are academics, other organizational member or experts.

Regardless of the model chosen "evaluation should not be an add-on or an afterthought. Evaluation needs to be planned into a project from the time it is conceived. The evaluation of needs, and a market evaluation if appropriate, should occur prior to the commencement of development of materials and may need to be carried out several times as development proceeds…" (Inglis et al., 1999, pg. 126). This is extremely important in light of the statements made earlier in the thesis regarding the typical poor process usually taken in creating, evaluating and improving e-learning courses.

Inglis et al.'s four evaluation factors
When planning for evaluation Inglis et al. (1999, pg. 129) note that there are at least four factors which must be determined:

i. *The breadth of whom or how responses shall be made in the process must be contrasted with the ease of analysis.* A large survey with a vast number of different kinds of learners can be very interesting but can also be very costly and complicated to gather and analyze.

ii. *Subjectivity* plays a major role in the process. Open ended questions, again, can provide interesting, and perhaps necessary data given the needs of the evaluator, however, the results are bound to be far more subjective than if a survey with closed responses was distributed.

iii. Linked to the previous points mentioned, *logistics* must be kept in mind. The required resources must all be in place should the evaluation be run successfully.

iv. Finally, again, related to an earlier point, a decision has to be made as to the *forms of analysis and the types of data representation* that will be used. Will ad-hoc hermeneutical interpretation provide the results of interest or will number crunching and graphing produce the intended results?

Sims' proactive e-learning assessment
Roderick Sims has put together a 'proactive assessment' to help a developer evaluate the key areas of their e-learning program; a selection of which can be seen in Table 2-4. See Appendix V for the remainder of the assessment.

Table 2-4 Sims' framework for proactive e-learning assessment

Sims' Suggested Components for Evaluation	Comments
Developers should assess "the amount of interactivity that is supported by the course." This can include student-student, student-teacher, student-content interaction (Anderson, T. D. et al., 1997, as cited in Garrison et al., 2003, pg. 103).	**This is an incredibly important point. As the importance of situated and active learning have highlighted, the level of interactivity provided is key to success. Sims points out the three ways in which this interactivity can be ensured within the course format and content, such as the student-content combination. Regardless of what manner(s) in which it is provided, it must be deemed to be done in an effective way, and if inter-human interaction is not available, perhaps working even harder to ensure a good level of interactivity with the computer/content, while remaining challenging, is essential. Interestingly, Morgan typically thinks of interactivity as something between the learner and the content, not necessarily a "lot of flash, bells and whistles." Not that he does not see the value in the "bells and whistles" but he has stated that if used improperly, they can "get in the way" of effective learning. Instead, in the e-learning program he and his colleague Adams have been developing, the primary interactivity is built into the pedagogy in a way that it is embedded in the learning so as to provide the learner with choices at all times. The "learning triangle" that models soft-learning always highlights the interconnectivity between the learner, the content and the context.**[25] **The interconnectivity of these three features is meant to ensure ongoing interactivity for the learner (Morgan, 2005, August 5; Adams, 2004, pg. 261). So long as they are well-placed and well-designed, the "bells and whistles" can play a crucial role. If not, they can be very important to the fun factor – recall that Hills says material that entertains also motivates (Hills, 2003, pg. 56) - which can be important to the learning process.**
The developer should be able to "(assess) the degree to which outcomes have been met. Are the learners satisfied with the courses?...(Are they) able to certify those who have successfully completed the courses? Are teachers satisfied with the work conditions and the workloads associated with the course? Are there mechanisms, in place…(to ensure)…that the course will be continuously improved, during subsequent iterations?…(Is it) affordable(?) …Finally, does achievement of the course outcomes really make a difference to individual students, their employers, and to the larger society?"	**This is certainly a logical ending to this stage of the evaluation, which should, of course, be followed by thorough analysis and required action to make the necessary improvements/corrections. Certification of learners, while not always possible or necessary, can provide a good conclusion to a course, help provide motivation to the learner, and potentially spread the word about the course and build its image in the wider society. It is not known, but hypothesized that different people in different locations, stages of life and careers, etc. may feel a stronger need or interest in gaining some type of certification. The reference to continuous improvement is very important because flexibility is meant to be built in at virtually all stages of an e-learning program and all providers wish to stay on top and in the lead with whatever they are instructing. Sims' final point sums up the essence of the program itself. Interestingly enough, he goes so far as to incorporate the 'larger society' here. While this seems like an idealistic thing to mention, and may be less applicable depending upon the provider's and learner's goals, this intent of improving not just the individuals or organizations, but the overall society is very much in keeping with the spirit of sustainability.**

Materials in this table were derived from Sims, 2001, as cited in Garrison et al., 2003, pg. 102-104

[25] There is a connection between this concept and situated learning. However, the triangle takes things further, as when utilized the learner is meant to be able to take the content/context relation in a course and reflect on it in regards to their own life, with the eventual goal of adapting the information to suit their own personal context; see Appendix II for the "learning triangle" diagram. (Adams, 2004, pg. 61)

Morgan's key e-learning course questions

Morgan has devised 13 key points (found at www.newmindsets.com/questions/overview.htm) that are meant to uncover the strengths and weaknesses when selecting (or as suggested here, to be used in designing) an e-learning program. First, a couple of concepts he discusses must be mentioned. For example, he refers to three generations of e-learning.

The first generation, technologically and supply-driven[26], is characterized by the instructor who controls the course and whereby the internet is limited to delivering the content. Keep in mind, this first generation of learning still applies in a standalone program where during the time of use it is simply the student interacting with the program and content.

According to Morgan, in the second generation, the course accommodates and changes for the learner as opposed to the learner adapting to the course. The second generation presents learning on demand and is a process which is driven by the learner. This second generation does away with the linear model that is typically found in traditional styles of teaching. (Morgan, 2001; Morgan, 2005, August 5) Ultimately, the second generation "encourages learners to (a) self-assess what is important, (b) reflect on how to apply the new insights in their own context, (c) push to action and (d) report on…impacts" from action resulting from the learning (Adams and Morgan, 2005, pg. 24).

Finally, the third generation builds upon the 'learner-controlled' second generation approach and takes advantage of "high band-width learning tools and supports such as complex simulations, virtual classrooms and other forms of "on-line" collaboration" (Morgan, 2001; Morgan, 2005, August 5). While the first generation of e-learning has proven effective at providing technical learning experiences involving memorization and conformity, the second and third generations will be more effective at providing soft-learning experiences involving interpretation and contextually based decisions. (Adams and Morgan, 2005, pg. 33)

In the following paragraphs, a selection of his 13 points is provided which highlight some of his best points and those which are not covered elsewhere in this thesis.

(i) **Services provided** - A portal is what acts as a channel between the course designer and the learner. It is important when selecting 'portal services' which act as a 'platform' for the course that sufficient flexibility is incorporated to allow for second and third generation e-learning. Without this flexibility, the designer can find themselves "lock(ed)…out" from ongoing improvements that could be made (Morgan, 2001).

(ii) **Granularity** - "Learning objects have to be designed and produced for the web from the "bottom up" in a granular fashion so that they can be accessed in a way that serves learner's needs as precisely as possible" (Morgan, 2001). This can be accomplished by "chunking" content into "byte-sized pieces." These "chunks" can then be combined in different ways or "accessed" by the learner in different ways (Morgan, 2001). Morgan works frequently with the corporate sector, and a point such as this, may be more applicable to the corporate environment. However, it is also important to consider this idea within the academic realm. This can bring many challenges. One risks oversimplification, missing important data, or failing to have the learner follow a key chain of thought. The learner may also look elsewhere, where materials could be confusing or be presented in a poor manner. Morgan responds to all of these concerns. A balance must be struck, but he tends to favour a more open structure providing the learner with freedom and flexibility to go within and outside of the program where they wish. He states that much depends upon the pedagogy. He says

[26] Supply driven in that it is centered on the provision of content rather than the creation and selection of content by the learner based on their demand.

that every "byte" in his e-learning program, *www.newmindsets.org*, is still in development, and is designed with open-mindedness. He makes use of the "learning triangle," discussed in section 2.2.6, that models soft learning by facilitating interconnectivity between the learner, the content and the context. Every "byte" used in this model is structured so that they include or illicit further questions, pushing the learner "back on themselves." As such, each "byte" is not just a simple straight forward piece of information, but information wrapped in clothes which provoke further thought. (Morgan, 2005, August 5; Adams, 2004, pg. 261) While it may be difficult for teachers to grasp this for a variety of reasons, such as wanting to provide larger sections of content or those which flow in a linear manner, the "byte" sized approach could very well be implemented in the academic sphere. This fits well with the previous recurrent discussion concerning learner-control, actually providing a method by which this can, at least, be partially achieved.

(iii) **Customization** - This thesis author has already addressed the importance of avoiding the 'one-size-fits-all' approach; this requires course developers to facilitate and support each leaner to customize the course for her/his needs, and it should be noted that such customization is necessary to allow for proper "second and third generation" e-learning (Morgan, 2001).

(iv) **Flexibility** - There appears to be an "80/20 rule" whereby 80% of a course's value can be provided in 20% of the time it takes to complete the entire course. As such, it is important that necessary flexibility is provided by the course design and course content so that the learner meets their individual needs as quickly as possible. "Tagging, hyper-linking and search capabilities" can assist with this along with other features such as the ability to skip through that which is already understood or deemed less important. The idea is to design the course in a manner which will more effectively meet the learner's needs. In the second generation approach, in order to maintain learner-control and to provide for learning on demand, Morgan states that courses should be designed in a non-linear format. (Morgan, 2001; Morgan. 2005, August 5)

This is not a straightforward matter by any means. Certainly, for the busy employee on the job who needs to refresh certain ideas or find facilitation for the outlining or analyzing of a particular issue, the non-linear format can be essential. They may not wish to go through an entire program or section to get to the one "byte" of information in which they are interested. When it comes to the student, perhaps in the higher education field, it can be more complicated. The approach can run into difficulties with teachers who either see things through the traditional approach or simply cannot seem to transform their teaching objectives to match this format. For the student, depending upon what they are learning and how they are used to learning, they too may have difficulties.

The younger generations seem to be more computer-savvy and are "being brought up on the web" which helps them to develop inquiring skills, to perform as and be interested in independent learning. In contrast, people were/are[27] typically socialized to become passive learners. These independent learners, upon reaching university, are being "put…in a box" where they must follow teacher-controlled activities. (Morgan, 2005, August 5) If it is true that most of the younger generations are more driven to learn independently, then a second generation, non-linear approach may suit them better, and if they are not provided this learning context, they may become frustrated in their learning situation. For passive learners, they may be helpless when engaging with this second generation learning. Blended learning can be used to provide different approaches and supports, as well as, to help to condition the learner to be prepared for second generation learning (Morgan, 2005, August 5).

[27] It is expected that the tense is highly dependent upon location, culture, etc.

In this thesis, it is not a major focus to determine and discuss different types of learners. An important possibility is that more than one educational method for the same material can be built into one program. This could mean providing completely different types of activities focussing on the same material which could enhance learning. Of course, knowing your target group is the best thing that one could do to provide the best option(s) possible. Perhaps, such assessment may reveal that there are significant numbers of particular types of learners in the target group. The point is to know as much as possible, and if it is reasonable, resource wise, to consider providing learners with various channels to the same goal.

(v) **Interactivity** - "Successful learning systems must create a collaborative, interactive experience where the user and system act as partners in achieving learning goals" (Morgan, 2001). While Morgan points out that there are different degrees of interactivity, this notion certainly paints a new picture as to the learning relationship established, particularly in a standalone system.

(vi) **Open Architecture** - Morgan emphasizes that designers should select an architectural system which is open in nature providing the learner with the opportunity to "explore" and "dig deeper…(or) more broadly" into any particular area they choose. The point is to maximize potential "learning paths" (Morgan, 2001). In principle, this seems to be a good idea. However, great care would be required to ensure that the learner does not get lost or confused. Part of this can be programmed into the course, however, in not knowing what else the learner could bring to the experience, it can be challenging to know what to plan for.

(vii) **Simulations** - A good way to provide for an active learning experience is to allow for the use of simulations. Of course, the incorporation of such features will be dependent upon technical requirements and cost, factors which can be prohibitive (Morgan, 2001).

(viii) **Evaluation** - How learners are to be evaluated is very important. Designers must be careful not to create a scenario where the learner feels s/he is being constantly assessed or that the computer is acting as the "Big brother" following every step they take. Such a setup can lead to an unsatisfied learner 'rejecting' the program. (Morgan, 2001).

When assessing a learner's experiences and what they have gained, Morgan has raised an interesting point that takes us back to the point of education and training and has serious implications for e-learning. He refers to the fact that

> "many learning standards encourage a "learn and test the learning" approach, which works well for content memorization or tightly controlled technical learning where carefully sequenced progress is desirable and possible. But they are not so well suited for encouraging informal, job-based learning where improved performance or increased reflectivity and personal understanding is the aim" (Morgan, 2005).

Here, Morgan makes a specific reference to company training and learning (i.e. as opposed to higher education). However, the message is relevant to both of these areas. It is imagined that many academic situations, obviously job-related situations, and certainly sustainability-behaviour linked situations demand "reflectivity" and "personal understanding" aside from simple "content memorization." To be successful at using what is learned in school or to be able to apply learning to become more sustainable, simpler technical work or content memorization will likely lead to failure. As a result, it is thought that building these features into courses, whether in the school or the workplace, and into any type of testing, should be done.

(ix) **Confidentiality** - It is imperative that the learner is assured that the course and their participation and input are secure and confidential, whereby the learner knows that only they can determine who else gains access to their work (Morgan, 2001).

2.2.7 Application of Laurillard's Tools

In this thesis there are two key groupings of ideas taken from Laurillard's work; a four part teaching strategy and key mathemagenic activities.

Teaching Strategy

The teaching strategy that is meant to guide teachers is interpreted within this thesis, more widely to include a variety of teaching applications (i.e. including e-learning programs, etc.), to improved quality of learning. This strategy includes four aspects - 'Discursive', 'Adaptive', 'Interactive', and 'Reflective' (Laurillard, 2002, pg. 77-78). See Appendix VI to learn how this strategy applies to e-learning in general, and then later in section 3.3 to see how the Chronos course measures up to this strategy. Others, like Inglis et al. have recognized the value in using this four part strategy in evaluating e-learning (Inglis et al., 1999, pg. 134).[28] Laurillard recognizes that this strategy can be both challenging to apply and could be misapplied. It is simply meant to provide certain ideal factors to lead to improved quality of learning (Laurillard, 2002, pg. 77). In all learning situations, a teacher or a computer or book, etc. and a student must assume particular roles. How well these roles are allowed or supported and how well they are assumed, play major parts in any learning context that the learning environment should provide. This strategy provided by Laurillard helps one to look at how these roles are or can be fulfilled.

It appears as if approximately 2 of the 10 components in the strategy can be met with general ease when designing an e-learning program while the remainder all face varying degrees of difficulty (see Appendix VI). While it is recognized that many of these can be met, the fact that so many of them face a unique set of challenges due to the nature of e-learning in comparison to classroom learning, for example, increases the expectation that such e-learning may run into barriers to success.

Standalone e-learning programs will have significantly more problems meeting the majority of components within the strategy. Clearly, effective feedback and communication factor heavily into this strategy. It is important that efforts be made to ensure regular exchange of feedback which could be done through 'meeting' or communication times and through various channels. A strong relationship between a live teacher and student is very important and deliberate 'testing' of students' understanding and feelings should be done regularly to ensure that the necessary communication is regularly occurring. This testing could be carried out by initially stressing the importance of communication at the beginning of the course and the creation of an anonymous comment system which students are encouraged to use to submit concerns and ideas regarding the course.

Mathemagenic Activities

According to Laurillard there are five key mathemagenic activities that students should address if they are to succeed in learning (see Appendix VII). While they are divided into five areas they should not be seen as "independent" since they should always be assessed in relation to one another (Laurillard, 2002, pg. 60-61).

[28] It is important to point out that this four point strategy and other Laurillard material was selected for use in this thesis well before the author read Inglis et al.'s comments which support the use of these criteria. These comments further support the value in using the materials derived from Laurillard's work.

They are as follows:

i) *Apprehending the structure of the discourse;*

ii) *Interpreting the forms of representation;*

iii) *Acting on descriptions of the world;*

iv) *Using feedback;*

v) *Reflecting on the goal-action-feedback cycle.*
(Laurillard, 2002, pg. 60-61)

See Appendix VIII to see how the mathemagenic activities intersect with general e-learning.

Application of these mathemagenic activities to general e-learning discussion is challenging. It appears as if virtually all of these activities face unique challenges when applied to e-learning which could hamper the effectiveness of an education program. What is clear is that having a solid understanding of a student group is absolutely essential to the course developer. The more that a developer knows about the students' academic background, knowledge, IT abilities, cognitive skills, and methods for interpretation, the better off they will be in designing or adapting the course. Using these activities to simply evaluate an e-learning course in isolation will not produce particularly fruitful results. Once again, effective feedback plays a major role in facilitating the success of teacher and the learner.

The mathemagenic activities are more useful if one uses them as part of a framework when interacting with students who have taken an e-learning course to see how well or how poorly they fulfilled the learning objectives rather than a simple theoretical discussion of how they relate to e-learning in general.

Laurillard recognizes the problem with setting prescriptive guidelines when it comes to teaching and learning, and as such, the teaching strategy and mathemagenic activities are seen as points which all learning situations simply "ought to include" to improve effectiveness (Laurillard, 2002, pg. 63).

3 Chronos Testing

While the preceding chapter provided a holistic introduction to e-learning, this chapter uses some of the information in Chapter Two in assessing the Chronos program and Chronos participants' experiences. This chapter also presents the context and results of the case study carried out using the Chronos e-learning course. These results include behavioural and perceptual results on the part of those who engaged with Chronos. These results, while connected, provide for a very different discussion than that which focussed on the background of e-learning in chapter Two. Participants' experiences with the course are further analyzed with a focus on their learning experiences in relation to the Norm Model.

3.1 Chronos Intro

Chronos is an e-learning program intended to educate company employees about corporate responsibility and sustainable development.[29] The course was developed by the WBCSD and CPI. It consists of a three to five hour, six lesson e-learning program that can be delivered online or through CD-ROM. It is designed to serve as an introduction and attempt to demonstrate to 'students' the importance of sustainable development and to get these individuals to think about how this relates to their company and to their roles in that company and in society, more broadly. Furthermore, it provides initial support to these individuals to help them understand what first steps they may take to make their companies more sustainable, such as assessing their individual position, the state of sustainability at the company, and potential reactions from colleagues (WBCSD and CPI, 2003).

While the program developers have stated that Chronos is most effective when customized for each organization's specific needs, coupled with a more holistic and integrated education strategy; for the purposes of this thesis the author simply assessed the impacts of the "standalone" version of the program. (Madden, 2005, A) What Chronos does is provide an interactive course that creatively displays concepts and does much to engage the student.

3.2 Developers' Perspective[30]

3.2.1 Planning

Diversity

During the planning and development of Chronos, it was difficult for the course developers to take into account the diversity of the WBCSD membership. Aspects like significant geographical distribution and members hailing from 18 major industrial sectors made things challenging. To deal with this diversity, the developers attempted to collect inputs from different places and groups and to include a cross-section of content. For example they included a feature using a world map to highlight 16 different company stories and to provide different company dilemmas in the 'You're in Charge' section. Beyond this, while WBCSD provided the business perspective, CPI's expertise surrounding learning was important. They also outsourced the design work to an e-learning company.

Next, dealing with diversity of opinion, provided the course developers another significant challenge. For example, when it comes to sustainability, there are many definitions and opinions as to what

[29] The course website can be found at www.sdchronos.com

[30] Virtually the entire section is derived from Madden, 2005, B, except the specific ideas of other individuals who have been cited specifically throughout the text ; See Appendix IX for further Chronos Developer's Discussion

should be included. As such, while the developers decided upon seven key elements, one member company, Rio Tinto, felt that they missed one or two additional key elements.

3.2.2 Implementation

Breaking In
When the developers were first creating Chronos, they genuinely believed they were putting together something very valuable that people were going to naturally demand out in the 'real' or in the corporate world. They were unpleasantly surprised when they ran into a disappointing speed of "take up". They did not encounter the demand they wished and when a new company was approached, if a sale was to take place, there was a significant period of time between the first contact and the time individuals within the company were ready to receive test copies of the course, trial the course, make potential suggestions for use and customization, customization of the course and then finally, any actual sale. While the course has only been available for one and a half years have found that the entire sales process takes an average of 18 months. There are a variety of reasons for this. Decision-making in a company can simply take a long time and if they are to engage in 'sustainability,' it requires a high level of commitment. The companies also need to have a perceived need for e-learning. The developers found that many French companies, for example, do not show this interest. Some companies will not use a program 'off the shelf,' meaning that customization is an absolute requirement, something that takes more time. Then, some 50% of the WBCSD's members choose not to engage with consultants, which complicated the process of seeking to sell and customize Chronos.

The developers have taken and are now taking a number of steps to improve the course. Last year they brought together users and potential users for a session in which helpful suggestions for how to use the program, how to integrate company information, and how to incorporate blended learning were provided and discussed. They are now putting together a more detailed implementation guide which should make testing and finally using the course easier. The developers must keep both buyers and learners in mind. Until now, they have typically aimed their materials at the actual learners and now they plan to do a better job in engaging the buyer, as an integral element in the entire course system.

Users
Madden stated that within a company, when it comes to sustainability, if those at the "executive level…don't get it, your company is not going to survive." As such the course could be valuable to facilitate increases in understanding about SD, at this level. However, the fact that mid-management is typically being pulled in different directions, plays a significant role. For these individuals the course can be particularly valuable.

The developers found that the course was used in diverse ways in different companies because of the variety of cultural-contexts, geographic location, industrial sectors and the company's position on the SD journey. Shell, for example, was seeking to educate all of their employees on these issues while other companies were not at this stage. Alcan, a Canadian-based internationally developed aluminium company, only used Chronos for its SD task force.

When it comes to planning for a diverse group, it is difficult to know who to design for first (i.e. sector, language, top-level, middle-level, lower-level employees etc). The fact remains that it is too costly and complicated to attempt to design many different versions of the program, at least initially. At some point the developer must recognize that s/he/they "can't create something for everyone." The Chronos developers are confident that they would not have planned the generic version any

differently. While further changes to the core course are not impossible (von Rimscha, 14 September 2005, C), at this stage, there is an emphasis placed upon communicating the value of the course to people in different positions. During the launch of the product marketing and communication was limited, in part, due to the limited funds available for this function, and as a result, this has led to one of the more challenging difficulties (von Rimscha, 14 September 2005, C). They are now responding by bringing together marketing experts to help them deal with the situation.

3.2.3 The Good, the Bad and the Other

Engagement
It is one thing for the people of a company to know that they should be or should begin to act in a responsible manner, however, ensuring that all employees know what sustainability is in their context and what steps can be taken to improve the situation are totally another scenario. If one takes a closer look at the few companies that have come to this newfound realization, one often finds "window dressing" or perhaps that sustainability issues have been limited to a 'special' section within the company…(What is needed is a) "bridge between strategy and culture" (von Rimscha, 2005, pg. 32). "Sustainability people" often have a difficult time breaking out of the same circles of people and other important specialists within companies such as information technologists, human resource specialists, etc. and as a result they find that their efforts to catalyze change rarely nears a tipping point after which significant changes are possible. Chronos can help them to engage new audiences in their companies. This is one of the program's greatest features.

While the course can engage a variety of individuals, getting them all to actually do the course successfully can be another challenge. Even for the employee who wants to take the course they are typically busy and have difficulty finding time to do something, which is valuable but not "essential" (von Rimscha, 8 August 2005, B). The program does allow for the learner to save their responses in the database which allows the learner to leave the program and review what they have done, provide time for reflection and/or resume where they left off (von Rimscha, 14 September 2005, C). However, as Morgan (2005, August 5) stated, training and learning within an organization have become somewhat of a luxury. Further, von Rimscha emphasized that companies will require a combination of sticks and carrots to motivate their employees to complete a course.

These challenges became very clear in the process of recruiting and having company people complete the course and follow-up questions for this research. Finding companies to participate was a challenge. Next, having all participants complete the course and the questions posed by the researcher either on time or at all was even more difficult.

Furthermore, companies must carefully determine the best time to give such a course to their staff. Given too late in the "sustainability journey," the employees may feel that they already know it all. However, if given too early, the management may not be prepared to follow up with the course or make any commitments after the fact (von Rimscha, 8 August 2005, B).

Evaluation
In terms of what happens with the course in a company, it is up to the individual company personnel to do the evaluation. One reason for this is the uniqueness found in each company. For example, a Chronos developer noted that one company has six values they incorporate into everything. As a result, these values would influence the way they see and would evaluate Chronos.

They took the current version of the course and tested it in very different ways in eight companies around the world including Sony and others. Dow's sustainability team looked how it could be

applied across the organization while other companies focused on different aspects. There was a problem with people not understanding the purpose of the program. Some would say for example, "it doesn't have any of our company examples in it." This problem of communicating the course to purchasers and users seems to be one of the greatest challenges faced by course developers.

Beyond testing, there have been a range of communication factors that have been problematic. It has been hard to get potential users to understand how the length of the course works, what is involved, etc., especially for those who cannot see the course in front of them during the communication.

Also, regarding their findings, after having spent half a million Swiss francs or approximately $400 thousand USD, the developers were not able to make any major revisions to the program due to inadequate funds.

The developers state that Chronos will be judged by the sustainability action that it helps to create. To date, the developers have only talked about how to gauge this important, yet seemingly elusive factor.

Language
While the WBCSD represents a variety of companies from different industrial sectors from countries throughout the world, Chronos was provided in just two languages, English and Spanish. Recently it was translated into Portuguese and there are plans to launch the course in Turkey amongst other countries. Sustainability needs to become 'embedded' into middle management and below, and if this is going to occur, the materials carrying these messages must be available in different languages. Unfortunately, the developers do not have more money to do the translations and they must wait for demand from companies who will pay for the translations themselves.

Developers Wishes
The developers, if they had the resources, would like to address a number of tasks. First, they would like to translate the course into a variety of languages. Next, they would like to improve the course in terms of interactivity, such as providing more things to click on, more diagrams, more opportunities for the learner to seek out concepts, and to find a way to reduce the number of words on different pages. For example, in the part discussing the lifecycle of the computer, it would be nice to be able to click on the parts of the computer to access the information and 'stories' behind those parts' and to provide a diagram which interactively illustrates and explains the journey of the computer.

The quizzes are the most popular part of the program because they provide immediate feedback to the learner, indicating potential weaknesses in responses and additional perspectives which can be applied to the answers. The course developers seem to have made an effort to stay away from telling people they are 'right' or 'wrong'. Fostering further reflection seems to be a major goal behind the feedback provided. The developers would have liked to have the feedback which the learner and computer provide, stay on the learner's computer so s/he could go back later to review them.

Throughout the course there is quite a bit of feedback. The feedback could be improved by making it "sharper and more up to date."

Finally, Chronos was originally designed as a standalone course, however, members thought it would be good to have group approaches and discussion built into the design. The developers did not have the resources for this type of construction. The implementation guide, now in preparation, will delve into how companies can approach both the course and the implementing of the sustainability issues in their own organisation.

Major Weaknesses
Besides the communication difficulties, perhaps the greatest problem with the course is the challenge in maintaining and supporting further development. Apparently companies frequently fail to understand why making what seems to be "a few changes" can take as long as it does. This is especially true for translation which can take months and "intensive effort by both translators and developers"[31] (von Rimscha, 8 August 2005, B). The initial English version causes difficulty because English is a "short language." As a result translations, at times, will not fit into the original layout/design which can even lead shortening of text, rather than graphical redesign. (von Rimscha, 14 September 2005, C; von Rimscha, 8 August 2005, B).

3.2.4 Development Conclusions

Suggestions
According to the developers one can "do anything you want with the program" through customization. However, you must be willing to pay the extra costs to request customization. This extra work is then split between WBCSD and CPI.

Regardless of how good the base tool is, in this case the Chronos course, employees are busy at work which will interfere with their engagement with the course. As such, this can raise the necessity that the course be well customized. Furthermore, moving away from the customization issue, it is important for human resources in a company to be part of the strategy, providing rewards and/or encouragement for the employees to complete the course and hopefully, to apply what they learned.

The developers advise companies to never provide Chronos as a standalone program. It is important to integrate the course into the company's learning objectives. If one fails to help the employees relate the course to their experience it is not going to work. von Rimscha goes further to say that to help facilitate the connection between the course and the company culture, it is far more impactful to hold follow-up sessions looking at reactions and what action the employee or the company may wish to take (8 August 2005, B).

On the other hand, if it is provided in a standalone manner 'conversation boxes' were included to help people reflect as individuals. Under these circumstances the learner is never left stranded, always receiving "lots of feedback on what works and what didn't." This helps to provide a "sense of achievement" to the learner.

Taking Root
The developers recognized that what is learned through a course stands a better chance of 'taking root' if the process is fun for the learner (von Rimscha, 2005, pg. 33). This fits in directly with Hills' discussion tying together entertainment and motivation. (2003, pg. 56)

On another note of getting what is learned to 'take root', being driven by the upper management will help, and yet, both "commitment" and engagement of all employees is required if the understanding and changes will really mesh with company culture (von Rimscha, 2005, pg. 35).

Expectations: Generic Standalone Users
Despite the positive features that the standalone version of Chronos is expected to bring (see

[31] The course contains approximately "130,000 words...every one of which, including graphics captions, system texts and navigation aids, as well as the main text, has to be translated and built into a new version" (von Rimscha, 14 September 2005, C).

Appendix VII for the positive features) the learners could face problems with disorientation and perhaps a lack of clarity regarding their experience. Ultimately the learner will likely find the course to be "excellent" and an experience which made them seriously reflect and yet one that may leave the learner uncertain as to what to do next (Madden, 2005, C).

Closing Thoughts
The developers state that it is important to remember that "Chronos is not (meant to be) a total learning solution." In closing, they are generally pleased and feel that "the program has worked in the way that it is meant to work."

3.3 Laurillard Supported Evaluation

Laurillard's teaching strategy, as discussed in section 2.2.7, helps to show what potential factors should be present in a learning course. Now, in Table 5 we will use this teaching strategy to assess how well Chronos meets these criteria.

Table 3-1 Laurillard's four part teaching strategy applied to Chronos

Discursive:	*Chronos*
i) The teacher's and student's conceptions should be continually accessible to the other;	**With the program acting as the 'teacher', the teacher's conception is continually accessible to the learner. The learner's conception is not continually accessible to the teacher. However, there is a significant degree of interactivity with interesting techniques used to gather and analyze the learner's conceptions and to provide feedback on a regular basis. For example, the learner's values are evaluated in an extensive automated questionnaire which is then analyzed and the learner's input is regularly requested and always compared with 'food-for-thought,' after the fact.**
ii) The teacher and student must agree to the learning goals for the topic;	**Based on the earlier interpretation of this requirement, this is possible even if there is no actual teacher.**
iii) The teacher must provide a discussion environment for the topic goal, within which students can generate and receive feedback on descriptions appropriate to the topic goal.	**In the current generic version of the program there is no set discussion environment. Again, the interactive features provide somewhat of an ongoing discussion between the learner and computer and the learner with themselves.**
Adaptive:	
i) The teacher has the responsibility to use the relationship between their own and the student's conception to determine the task focus of the continuing dialogue;	**While there is some pre-set two-way conceptual analysis possible, this is very challenging as it is not believed that the necessary automated intelligence exists to supply this function in the absence of a human teacher.**
ii) The student has the responsibility to use the feedback from their work on the task and relate it to the conception.	**There are a variety of mechanisms used in the program to provide pre-defined feedback. For example, in lesson two, section one, the learner reads about the 'story' or lifecycle of their coffee and their computer. The learner is asked to select a visual representation of their feelings towards the stories – 'interest, concern, bored'. Once a selection is made, a commentary is provided in response to the selection. Next the student is asked to write into the program, her/his reflections on what they felt and perhaps why they felt that way. Finally, the last page of the**

Discursive:	*Chronos*
	section wraps up with a brief discussion of values, the topic of the next section. This interplay could be seen as the provision of forms of feedback which the student could then use to relate to their overall conceptions and values about SD.
Interactive:	
i) The teacher must provide a task environment within which students can act on, generate and receive feedback on actions appropriate to the task goal;	**Chronos provides pre-designed feedback, of sorts. Carrying on from the description of lesson two, section one, in the next course section the discussion of values continues. On page four, the student is prompted to input the "four things that capture the challenge of sustainable development for you." This is then followed by a general discussion of the challenge of sustainable development; this encourages the student to reflect upon their input (still visible on the next screen) and the general discussion. While the learner may be limited in their ability to generate feedback, they do have an opportunity to act on the feedback they receive due to the clever layout and design.**
ii) The students must act to achieve the task goal;	**Throughout the program there are a variety of task goals that are provided such as those already discussed. Another example is lesson 3, section 3 which provides a variety of interactive role playing scenarios where the student plays a major role as part of a corporation facing some sort of dilemma (i.e. here this author follows the role play of an accident at an aluminium plant in a former Soviet country). The student is given a story and is then asked to input potential next steps. They are then introduced to a wide variety of stakeholders with very different views. Next, the student is encouraged to imagine that they are a resident living near the plant, and then in their original role to brainstorm available options. Here the program diverges as the student must choose from among three options for the plant. Without continuing on with an explanation of how the student continues, we can see that within pre-defined boundaries, the student must actively engage in achieving the task goal for this section.**
iii) The teacher must provide meaningful intrinsic feedback on their actions that relates to the nature of the task goal.	**It does not appear as if intrinsic feedback has been programmed into Chronos.**
Reflective:	
i) The teacher must support the process in which students link the feedback on their actions to the topic goal for every level of description within the topic structure.	**While there is no live teacher per se, the lessons involving the student's values and the role play demonstrate a creative design which provides, at least, some type of feedback and a pre-designed supportive framework. This framework carries through with these ideas throughout each lesson beyond simply raising them separately within a particular window.**
ii) The student must reflect on the task goal, their action on it, and the feedback they received, and link this to their description of their conception of the topic goal.	**While the latitude within which the student will work may not be ideal in regards to their ability to act on each task goal and the type of feedback they receive, both are possible none–the-less, which opens the possibility for them to link these aspects to their conception of each topic goal.**

Laurillard's Teaching Strategy -2002, pg. 77-78

It appears that Chronos fails to or partially meets approximately 1/3 of these ten components with difficulty which could indicate added problems for the learner. The remaining components are met to varying degrees, however, there is evidence showing clever and creative attempts to address these parts of the strategy. The addition of a live teacher and effective communication and flexibility would greatly improve the ability of the Chronos course to meet these components.

Analysis

The unique qualities and advantages of Chronos are fairly obvious, although, Laurillard's tools do not highlight all of these points. For example, the quickness, creativity and potential ease and appeal of Chronos fails to come through in the assessment according to Laurillard's tools.

Laurillard's tools

Laurillard did not necessarily intend to have her teaching strategy or mathemagenic activities to be used as tools for evaluation of e-learning courses. However, using these proved to be helpful for the thesis author to build a better understanding of e-learning, in general and Chronos, in particular. Her tools provided value in identifying basic expected benefits and challenges associated with various aspects of the course It is believed that her tools provide a good guidepost for the development of further research designed to investigate and to compare teacher and student experiences in traditional and in e-learning course contexts. Clearly, this is not the entire story. These two groupings of criteria fail to raise many important details, some of which are illustrated in this thesis.

3.4 Chronos participants[32]

3.4.1 Participant group profiles

Chronos and the corresponding questionnaire was given to IIIEE students, a Toronto, Canadian-based internet related company and a second Toronto, Canadian-based telecommunications company. To see how the questionnaires were prepared and responses analyzed, please see sections 1.6.4 and 1.6.5.

IIIEE Students

The 10 IIIEE students who completed the course and the questions (initially, this was 13 students) from 10 different countries with varying cultures and diverse academic and professional experiences. The students were near the end of their second semester of the international MSc program in Environmental Management and Policy in IIIEE. They are soon expected to be sustainability experts based on their work and academic experiences. These participants were asked to complete the Chronos questionnaire in reference to their last workplace experience and the vast majority of respondents had no problems in doing this. The students ranged in age from 25-28, except for one in his/her early 30's.

As the answers were submitted, they were first divided by the participant's gender and then by birth country type (i.e. developed and less-developed). Based on those who completed the work in the end

[32] While it represents the minority, not all participants completed the course and the questions posed to them by this thesis author. Furthermore, some of the participants who did complete the course did not follow the requested time frame nor did they put in the effort that was expected from them. This was seen in correspondence with the participant's, late answers, and incomplete or inadequate answers.

there were three participants included in each grouping (i.e. three under developed country males, three under less developed country females, etc.). The only grouping with less than three was the less developed country males, which only included one participant.

It was expected that the course would, in many ways, be a review for these students and that their learning experiences and opinions could be used as a critique of the Chronos course more than anything. Primary analysis was placed upon finding general patterns in their answers regarding their learning experience and the Norm Model analysis, however, if patterns seemed to emerge related to gender or country type, these too were noted.

Internet search/directory company

The Internet search/directory company, a Canadian entity with approximately 65 employees, helps connect consumers to product and service providers through a directory which they provide both online and through a printed directory. The product and service providers pay for placement and additional advertisements and the major emphasis seems to be placed on the online presence.

Initially, while 13 employees were committed to participating in the research, ultimately, only 9 ever completed the course and questions. For analysis purposes, participants' responses were split into three groups; females (29-38), females (21-26), and males (30 and 44) of which there were only two. For the most part general patterns were found across, rather than within these groups. These participants had a range of educational backgrounds including business, journalism, music and environmental science, and six identified as being Canadian while the remainder identified with being Polish, Brazilian and Dominican.

Interestingly, while it was not clear before engaging with the company, they have always had a major environmental focus due to strong environmental leadership within the company. For example, 'green' clients are recognized in the directory and are provided with significant discounts to should they wish to advertise. This had a strong influence on the process as participants naturally migrated towards environmental issues throughout the process and virtually ignored the social pillar of SD in all stages of this research including the questionnaires and the focus group.

Telecom Company-Finance Participants

The telecom company is Canadian and provides "solutions to niche markets" around the world. They offer a range of services from operator services to Voice over Internet Protocol and low-cost long distance calling (Participating Telecom Company's Website, 2002).

While the telecom company could only initially commit eight participants to taking Chronos, not the hoped for minimum of 10 participants (of which only one employee was fired and only five completed the course and questions), they were included in the research as they were seen as playing an important role. The IIIEE students were primarily meant to provide a critique of the program as sustainability experts and the internet-related company included employees who filled a variety of other roles and as such were expected to have a variety of perspectives. Furthermore, as the process moved forward it became clear that the internet-related company also had strong environmental leadership, which is rather unusual. As the telecom company had the financial department working on Chronos, they represented a very different perspective, one which was not environmentally driven in anyway.

While the telecom CFO stayed positive, considered running a post-Chronos focus group, and repeatedly requested his employees to complete the Chronos work, only five of the eight sets of responses were ever returned. Besides one or two participants, the group clearly did not put a great deal of effort into their answers. Additionally, one of the seven who failed to complete the work was

the CFO himself/herself who was the contact for the research and the leader within the telecom finance group. Obviously, when the group leader is disobeyed and then the leader him/her self who has personally committed to a process multiple times, fails to follow through, there are a number of problems both in the research, and possibly within the company. These problems, once again, help to illustrate the point that Morgan stated that training has become a luxury and something that can be easily overlooked or dispensed.[33] It also shows the imperative of motivation that is linked to both strong leadership and individual drive to engage in a process. While the answers the telecom participants provided are not information rich, they were assessed, nonetheless.

The group was approximately equally balanced between males and females, included participants who fill finance-related posts and have business-related backgrounds. Interestingly, only one in the group identified her/his nationality as Canadian while the others identified themselves with countries/groupings such as Pilipino, Chinese and Asian. This is not entirely surprising seeing the large number of immigrants Canada accepts every year and the encouragement the country provides to the population to be proud of their heritage. Participants ranged in age between 26 and 39. Due to the small number of responses and the lack of quality answers, no major patterns were found linked to characteristics such as gender or nationality.

3.4.2 Learning experience - course strengths, weaknesses and needed improvements

The Students from the IIIEE Class at Lund University - Learning Experience

Lessons Learned

For the most part, virtually all participants seemed to pick up on the same key themes that they claimed to have learned from the course. At the same time, as they had all been schooled in many of these ideas previously, it is not surprising that they came to similar conclusions and perhaps a good sign that they reported such similar results. They saw that the course was about making the business case for sustainable development, the importance of across the board understanding and action, opportunities for employee action and empowerment, the importance of stakeholders, and the reflection of personal and company values.

How They Learned

Here again, it was clear that some strong features were repeated again and again throughout the participant's answers, and which also agreed closely with what was reported in the e-learning literature. Repeatedly, the learners stated how much they favoured the tasks which allowed them to interact, take action, and connect personally and ideas with particular contexts. One learner's experience helps to sum this up very well:

> "I think the interactive feature helped me learn the most, especially the section "the conversation", where I had to choose which line I would answer in that particular situation. It was more difficult than I had thought" it would be. "It made me think a lot about how different stakeholders would react. The second feature that I learned' much from were the "the spaces in the sections where I had to write some of my own reflections. The reason I found them helpful was because they forced me to stop, think and reflect on what I had read, if this feature had not been there, I wouldn't have thought about what I read as much as I did. Another feature is the stories told in the

[33] Of course it is possible that the group selectively thought this particular kind of training was a waste of time and failed to engage for this reason.

> sections, for example, the one about the accident at the factory and I was flying there to deal with the aftermath, the real life story provided a more realistic feel to it and the role play helped me to think from a different perspective."

These connections and comments fit extremely well with what has been drawn from the literature. Active engagement, situated learning, and learner-control are all features which come into play here. A number of other learners explicitly wrote about the importance of these interactions. More than one learner emphasized that the role play exercise provided a "good overview of pros, cons and dilemmas" which both improved the exercise, but also reflected well on the job of the developers in this section.

Quite a few of the students recognized other features such as the real-life examples and products which they can identify with and the importance of video and visuals. These real-life examples and "facts always remain(ed) deeply in mind" and represented further situated learning. One student stated that the facts had such a strong impact, that they felt greater need to change their behaviour. While the video was not used extensively or in a particularly effective manner in this course, the learners recognize that video and visuals provided "relief", 'woke' them up, and 'remained' with them. A few students commented on the text finding that it was well done, concise, and easy to understand.

While at least two of the learners were critical of the content, one of these critics still stated that they appreciated the manner in which the course presented a "good mix" in terms of information, the learner being forced to question one's self and their organization, and ending in a personal action plan. Again, this represents many opportunities for active learning. The same learner liked the element of the course that permitted him/her to return to the course at a later stage and that further information could be accessed "easily" through hyperlinks; these are points which Morgan discussed as key elements in providing learner-control.

While there was a split between those who liked and disliked the multiple choice questions, a number of learners recognized the value in the other forms of interactivity. It was unclear that for those who disliked these parts, whether it was due to the format or the content. One learner stated that during these questions it felt as if there was "an actual teacher" with you asking you for the answer and for your justification of your answer. This is interesting when looking at Laurillard's tools which strongly suggest the need for a human teacher to be involved the learning process. While this example, by no means, even begins to prove her recommendations to be wrong, it does open one to the fact that in the absence of a human teacher, one may be able to construct a virtual teacher that helps to improve the computer-based learning process.

This brings us to another interesting point regarding Morgan's discussion of the independent active learner. In Chronos, with the multiple choice questions, the learner is clearly taking action and in one sense being independent, and yet, if they feel there is a teacher sitting there with them guiding there steps, perhaps they are not really being independent and in fact are falling back into a more passive stance. Could we have a learner be both passive and active at the same time? This same learner found the messages and information to be "so" useful that the learner can avoid needing background information before engaging with the course, leading to what s/he exclaimed to be an "efficient!" outcome. Again, we confront a number of issues. If this is true, efficiency is a good thing and ensuring that the learner is not in over their head with new information without necessary background is also important. However, one gets the sense that this learner is so pleased with what s/he have learned that it can be inferred that s/he will not be making great efforts to reach beyond the course to find new information. First, this is passive which could be seen as negative in itself. Furthermore, as one learner emphasized, there could be some bias and problems with some of the

content. If the learner does not take in the information with a critical eye or does not reach beyond the course content, they may obtain a limited perspective or a faulty impression.

Room for Improvement

In addition to the expected faults[34] the learners highlighted a number of areas for improvement. Some found the course to be too long. These reflections certainly fit in with Morgan's ideas to improve learning by making the process non-linear and more granular (Morgan, 2001).

One individual did not like the fact that content was included which

> "appeared to (the participant as something) more like advertisements for dubious practices of the companies that are obviously part of WBCSD. For example the Coca-Cola case: instead of letting people sell their own stuff, Coca-Cola equips them with their (unhealthy) drinks to make society even more unhealthy in order to increase their business. This is not a good example but as bad as it can be…So, (the) question remains: what does WBCSD want to achieve with this course?"

It is likely that there is some pressure on the WBCSD to include there member companies and in a good light. Another student from the IIIEE class found the course to be more of a public relations exercise than one which is educational. That student stated that key faults like a failure to thoroughly reflect on the "societal conflicts underlying the different interpretations of sustainable development" and making claims such as "the view that companies have a social responsibility is becoming the dominant view among executives – but without giving any proof for such bold statements" is inexcusable.

Back to the Coca-Cola complaint, including a company like this can be a good thing in that it is easy for the learner to identify with the product and the company, which could lead to a more impactful learning experience. However, as the learner questioned, what is it that the WBCSD is aiming to achieve. Depending upon the background and perception of the learner, s/he can pick up on this type of message or agenda and disagree with this. If this should occur, this could have a very negative impact on the learning experience as the course could lose its legitimacy. Furthermore, if the judgment of the learner is correct, then at least parts of the course could be seen to be promoting unsustainable behaviour in a course that is all about promoting the opposite. Besides the complaint this participant stated that s/he especially valued the role plays and that s/he had not previously taken such detail into account concerning different stakeholders; consequently the respondent felt that it could factor into his/her future stakeholder management and reflection.

The same participant found the multiple choice questions to be tiring, however, s/he emphasized that his/her prior knowledge of what s/he were learning could have led to a state of boredom and that people who are new to the topic may very well enjoy these tasks. The course developers have stated that it is important to be wary when giving the course to those who have already gone quite far on their "sustainability journey" because they may think they know all the answers. Such a response was expected as the IIIEE group of students has already learned much of the material throughout their two semesters at the IIIEE.

Another student wrote about how additional case studies which included potential solutions would have been helpful.

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[34] Faults such as the course leading to greater awareness and motivation but fails to equip the learner about what to do next in a significant manner and the lack of more personalized content were predicted by the developers who believe that these weaknesses can be remedied through proper course customization.

Interestingly, one student noted that additional introduction of what would be learned in each section of the course, would have been helpful. Perhaps this could help the learner prioritize or prepare better for what is to be learned.

One of those who disliked the multiple choice questions, found them too limited and repetitive. S/he also felt that these questions were too open-ended. When the course responded to an answer stating "sorry but we think …. is the correct answer" that this detracted from the "apparently non-judgmental aspect of the course." This response connects well with the literature where Hills says (discussed in section 2.2.4; Hills, 2003, pg. 83) that the program can take on a negative human element and upset the leaner. In this case the learner suggests that the wording could be changed to something like "what about…." or "have you ever considered that….."

Internet-related company learning experience

Lessons Learned

For the most part, the participants understood that the course helped to show the major roles companies have played and can play in the future regarding establishing sustainable societies. While some seemed to get the general three-pronged definition of SD – social, environment, financial – there was a much clearer focus amongst the group on environmental issues. One person went so far as to say that s/he summed up the course as being driven at increasing awareness of environmental issues within the corporate structure.

Many people talked about a newfound recognition that they as individuals do impact the world around them both locally and globally, and as such, could take more responsibility. For example, one person stated s/he had heard of SD but had no idea of the "importance" of this concept in their life. Many also clearly identified with the discussion of the sustainability implications surrounding the products they use on a daily basis. These patterns indicate both increases in motivation and knowledge.

A number of participants wrote about how they now understand that when a company acts more sustainably this could not only avoid risk but provide for win-win situations.

How They Learned

One person reflected on how s/he found it valuable to learn about the importance of considering and engaging with a variety of stakeholders in a business. It appears as if the contextualization or the 'situated' nature in which these messages were conveyed helped to engage the learner.

The initial quizzes at the beginning of the course helped people to 'step out' of their lives and to begin thinking about the wider world. One person wrote about how s/he felt s/he had a good handle on these issues until s/he began getting so many answers wrong, which led her/him to think even more.

People appreciated the quality of the material and the concise manner in which it was delivered. One went so far as to say that the developers managed to design the course to "fit into the lives of busy people without jeopardizing the value of its content." This is interesting since through all the testing of Chronos, some felt that it had not gone far enough in this respect, there was still too much text, and it failed to achieve the kind of granularization which Morgan wrote about (Morgan, 2001).

Repeatedly, the level of interaction provided through the course was appreciated. In particular, the role-play was good at this and made people "think" more by forcing them to back up their choices. Another wrote that the role-play helped them relate to another person who may have different ideas and goals and showed how their choices could change if they were put into a different situation. This

discussion highlights both an interesting manner of situating the learning and potentially helps promote double-loop learning.

The same person stated that the short answer format was good as it forced him/her to put their thoughts into writing, which in turn, made her/him "think more about it". In fact s/he said s/he would be more likely to remember what s/he wrote down in comparison to the rest of the material in the course and that this style of answer helped him/her to frame the ideas. This could in one part be one person's learning preference coming out; however, it seems that the active learning component is what take precedence here.

As mentioned, the stories about people's everyday products helped in many respects. According to one participant, these examples helped him/her relate to very different peoples' lives which play out in lands far away from the participant's office and presented the learner with unfamiliar knowledge. Here we have situation of knowledge, increases in knowledge, and bridging gaps between people, geography, experiences and concepts through common products. These examples and others (role-play, and the section regarding approaching colleagues/bosses regarding SD) helped this learner to visualize how s/he would go about dealing with these issues in their life and were superior in that s/he felt as if s/he were "gaining new knowledge" which s/he hoped to share with others. This provides evidence of increased knowledge, potential motivation, and intentions to both apply the ideas found in the course and to spread them beyond those who took Chronos.

Finally, it was appreciated that the learner could stop and start the course when and where they wished and that the progress boxes helped them do this effectively. This is directly in line with Morgan's discussion of learner-control (Morgan, 2001).

Room for Improvement

Interestingly, while one participant found the information to be solid and concise others said that s/he found there to be a "tremendous" amount of information which was "difficult to retain in a busy environment." Granularity would probably have assisted this learner who suggested increasing the level of interactivity to help transmit the information in a more effective manner. S/he appreciated and said that increasing the level of diversity within the course – assumed to be the messages and types of delivery – is a good idea.

Only one person raised the prospect of incorporating interpersonal interaction to the course. This is very interesting since interpersonal interaction is believed to be such an important feature in the literature and in Laurillard's tools.

Yet again, very little constructive feedback was provided. One person went so far as to say that s/he could not find a single "least helpful feature" and that s/he would not change a thing. This person was not alone in this perspective. Of course, people do not always know what will help them learn the best, and yet, responses like these make one wonder if you can simply get away with the standalone format which contains so many potential weaknesses, when judged by Laurillard's criteria.

The Telecom Learning Experience

Lessons Learned

Based on the responses from the Telecom employees, it is clear that, on the whole, they seemed to learn very little and it is questionable how many of them actually took in the main points of the course. While one person did state "(t)he course is a tutorial on business and sustainable development; I learned to be more environmentally aware and think about what I can do to help the environment" another wrote about how s/he learned to present a "case" to their manager who has even more pressure, not explaining what case it is s/he are going to present or where the issue of

extra pressure comes into play. One person appreciated the interesting facts the course helped them learn that s/he would have never bothered to take the time to uncover outside of taking the course.

How They Learned
Even the individuals who clearly put in less effort than the others still picked up on some of the same features which helped them learn as the others. One individual appreciated the multiple choice and the regular, virtually immediate feedback which helped them see the "overall picture". Another liked the role playing which helped them understand what to expect and to offer methods of dealing in different circumstances. Even for those who put in little effort they could see the value in the interactive and situated aspects of the course.

Room for Improvement
There were interesting similarities in the areas they noted for improvement. They wrote about how the video could be used more effectively and that there was too much text which led to "information overload or loss of interest at some points." They suggested that the course developers "should try to summarize points more and to only highlight the very important issues." This is explicit discussion directly in line with Laurillard's statements that 'book' learning places a heavy burden on the student and with Morgan's ideas to improve learning by making the process more granular.

3.4.3 Norm Model Analysis

The Students from the IIIEE Class at Lund University

Organizational Focus
There were more *'developed country'* individuals engaged in jobs that had a core function involving working on environmental issues in comparison with those from the less-developed countries. Likely, this means that those in the study from developed countries could have greater experience with, understanding of and have taken more action towards environmental issues. While there is no way to confirm this, it is possible that the systemic condition of greater wealth in the developed countries provided more of them with job opportunities, which focused strictly on environmental issues.

State of the Economy
There appeared to be a range of perspectives when it came to the state of the economy and its impact on participants' respective companies. While it meant different things for people from different countries, many, in both developed and less developed countries raised the importance of China and Chinese economic decisions and experience as to what might happen in their different countries. Also, a number of individuals raised economic instability as a feature which will likely negatively impact the options available for taking environmental action. Furthermore, a number of developed country participants saw the instability leading to less government focus on and less spending/subsidization for environmental initiatives both at home and in less-developed countries. For the most part, the economic discussion from most participants raised concerns of key systemic conditions which are expected to limit environmental action.

Social Goals
In terms of the social goals, the participant's organizations differed in what they cared about, if they cared about any social issues at all. Some of these concerns were contextually dependent. For example, manufacturers in less-developed countries were seen to either not have any concerns or to focus on what some might see as more 'typical' issues such as not using child labour.

Individual Environmental Action
There seems to have been two major groups of people when it comes to past company, environmentally-related, behaviour. There were those who had limited their actions to activities such

as paper recycling, water use reduction, and cleaner transportation, and then there were those who had taken much greater action such as planning related conferences, initiating internal waste separation programs, and things as involved as writing green shopping guides. Usually there was a relationship between those living in the developed countries where their organizations were aimed at environmental issues and individuals who had engaged in more significant environmental actions.

For those who attempted significant environmental actions, they were often blocked by a wide range of systemic barriers. Those individuals from less-developed countries wrote about managers who said that such action is not part of the core business strategy, the competition would not bother with such action, and the fellow employees would not engage with making such changes unless they were to see some obvious benefit to themselves. One student from a developed country tried to arrange for the purchase of a biodiesel company vehicle, but unfortunately there were no stations in their country which sell biodiesel fuel. Another developed country participant who had something positive to say about their company's record, stated that while some environmental action has been taken over time, only in the past two years has the company begun to develop an appreciation for such action as they see it to present value for their brand. Unfortunately, but not surprisingly, this respondent noted that no action is ever taken unless there is a direct impact on the bottom line, as a result. Here we have the recognition that valuing environmental action has changed, which can lead to greater motivation and potential willingness, and yet, as the bottom line dictates all action, any change, once again, comes down to this systemic condition.

In terms of those taking personal action towards environmental sustainability, they seem to make the same observations. They make "small"[35] changes by recycling, make green purchases, avoid carbon intensive transit by walking, taking a bike, avoiding planes, etc. and attempt to influence friends. Two individuals honestly stated that people have a hard time maintaining/remembering to maintain green behaviour and that their actions do not always live up to their good intentions. From these responses, it is clear that knowledge is not a problem, while systemic conditions can play a role, in these cases willingness is especially pivotal.

There was a range of feelings toward whether or not Chronos will help participants improve their organization's environmental records. Few felt there would be no impact. While another that declared it is hard to judge the impact it will have, the course does have a positive effect in leading to "thinking more, analyzing more, talking more, socializing more, listening more, getting more information, caring more." Others made more specific statements like they will be more able to make the business case for SD to others or will take a different approach with various stakeholders in light of the Chronos role playing and/or will be more motivated. From these responses we see increases in knowledge and willingness which could have a positive impact. One participant expressed the opinion about using the arguments learned in the program in the workplace. That person stated that the course will only help if s/he will have future access to the course so that s/he can refresh him/herself with the 'well articulated' arguments. This response is in accord with Morgan's discussion of having on-going independent access to the course and specific 'granules' of information (Morgan, 2001).

Integrating Social, Environmental, and Economic Considerations

These three elements are generally seen as the three pillars of SD and surprisingly, for the IIIEE group of generally progressively minded, young, active members from throughout society and around the world, very few could reflect on attempting to integrate all of these three factors into their lives or workplaces. Every other person had either not made an effort, was unaware of a need to do so or faced tremendous barriers in trying. This demonstrates an entire failure on the part of the participants

[35] It does not seem uncommon for people to put down these types of actions as little or being less significant. It was found that the course helped some of them to improve their appreciation for such actions.

to integrate all three factors of sustainability into their lives in terms of all three aspects of the Norm Model; knowledge, willingness and systemic conditions. It certainly leaves one wondering about the state of the planet and our society when this many highly selected individuals have not yet become engaged in combining all three pillars of SD. The one who had made an effort to integrate the three factors in the workplace stated that it was very hard to do and normally one factor eventually winds up dominating in the end. Furthermore, this same person stated that when it comes to their personal life s/he "normally (does not) think in these categories. Of course, (s/he) tr(ies) to be social, have fun, whilst not spending too much money and not polluting too much." This sounds reasonable and yet leaves one wondering, if integrating the three factors of SD is this difficult, so few of the group are trying to integrate it in their workplace, and one of the few that does, does not make an explicit effort to bring this into their private life one is left to wonder what the future has in store and for the potential of consistently integrating all three. This provides a powerful negative willingness-related example.

Very few indicated that they will be making a special effort to integrate all three factors in the future.[36]

Course-Company Connection
There was a mix of responses in this area. Some participants noted that without knowledge and understanding, action is virtually impossible to take. They emphasized that this course helped to contribute to a foundation that will be used to make future decisions. These same people felt the course helped make sustainability concepts easier to understand and easier for them to explain to others. Quite a few noted additional motivation after having taken the course. Others felt it connected poorly with their own work situation due to already knowing the information, the course content being too contextually specific, current significant personal engagement, etc. As such, depending on which participant one spoke with, one heard that the course reinforced or brought to light new information and motivation, which connected to the knowledge and willingness parts of the Norm Model while others had a more negative impression. Again, it should be remembered, that it was expected that many of the learners would already know much of what was in the course.

Course-Personal Connection
The vast majority of respondents said that the course had little or no impact on their personal lives, often because they are already engaged. Those who did find something positive said that the course will help them make better arguments when dealing with these issues in personal situations. This again, demonstrates an increase of knowledge.

Anticipated Colleague and Management Reaction
Again, here there was a range of answers, however, many were negative. People thought colleagues would not have time unless they were pushed or were especially motivated, they, would not be interested unless content was tailored to their particular circumstance. Other reactions were that many would not care about the issues covered, they would be bored for different reasons such as they already know the material, etc. Of course, these comments fit in directly with Morgan's statements (2005, August 5) about learning being a luxury and the Chronos developers stating the benefit of customization. A few thought colleagues would like it because the course used real examples they could connect to; the course is well developed and it could help to lead to new ideas to develop more business.

[36] On a technical note regarding the survey, the questions surrounding the three factors of SD were somewhat redundantly posed in comparison to previous questions and came towards the end of the questionnaire. It is possible that for those reasons, the participants became fatigued and did not answer this question to the best of their abilities. Regardless, enough clear answers were given in response to all of the questions, even towards the end of the survey. This raises concern due to the indication that respondents do not plan to not make efforts to integrate all three factors.

The Internet-related company

Organizational Focus

As this company provides a directory product it can be challenging for them to see how SD fits into their company. Furthermore, as they have strong environmental leadership from the top and already provide 'green' companies with recognition and discounts in their products, it becomes that much more challenging to think of new ways to incorporate environmental or SD-related ideas into their core business strategy. Interestingly, this small to medium sized business even has a full-time environmental manager. Having someone focused on these ideas helps to ensure that there will be at least one person within the company to help drive new initiatives.

State of Economy

People in the company seemed to share the idea that times are good regarding the economy and the company, however, one warned that should the larger economy begin to fail, their business would be one of the first to be impacted by the change. This indicates that now, while things are good they may be better able to afford to make certain changes, however, their company, and perhaps their SD actions may not fair well should the economy take a downturn.

Social Goals

Interestingly, when asked about the company's social goals, the vast majority of participants talked about the company's commitment to environmental issues. In fact, there were almost no social goals raised.

Individual Environmental Action

For the most part there were two groups of people in the company when it comes to environmental action. There were those who stated they have done nothing, and the others who do things like recycle and reuse paper.

Interestingly, at least one person, who does recycle, seemed to be disappointed to be doing so little. To elaborate, it appeared as if the company is making such great effort such as printing the directory on recycled paper with vegetable based ink, that the participant's recycling efforts felt belittled in comparison. This is interesting because who would have thought there would be a downside in this respect to having the core company making greater environmental efforts. Perhaps this participant does not know what else to do. Regardless, motivation does not seem to be a barrier for this person. Another person felt that as the company already takes so much environmentally-driven action, that s/he did not think that s/he needed to take any additional responsibility upon him/herself. Here we see a potential lack of understanding, but certainly a problem with motivation that has a logic-related basis.

Two people stated that they put a plant on their desk when asked about the environmental action they take. In their defence, these people do recycle. However, when an environmentally minded company still has employees who are limited to putting plants on their desk to contribute to the environmental sustainability of the company, this suggests that there could be a host of problems that range throughout all three areas found in the Norm Model.

During the focus group with this company, which is discussed, in depth, in section 1.6.3, it was determined that the two greatest environmental impacts of the company were transportation and energy related. Only one participant talked about making an effort to save energy and no one talked about transportation, even though, these are likely the most important areas for them to address.

A number of people felt that the course had increased their motivation to make more of an effort regarding environmental issues in the future. Some talked about how they plan to be more mindful of

the products they purchase and others discussed that their new understanding would help them feel more confident in making suggestions in the future. Here we see an increase in motivation and knowledge which combined to direct behaviour and legitimize future action.

Integrating Social, Environmental, and Economic Considerations
Very few, if any of the participants have actually tried to integrate all three of these considerations. Most participants simply have not tried whether due to motivation or knowledge-based barriers while others have run into resistance from those who think that such actions are "weird" or "too expensive."

Ironically, while one person said their failure to integrate these issues was due to the expected higher cost, another person said that due to having lesser financial means s/he are forced to engage in activities which are not only cheaper, but have lesser impacts in the world (it is uncertain if s/he mean both lesser environmental and social impacts).

It was unclear how many people will actually make an effort to integrate these features in the future. One person said s/he planned to but did not want to sound "preachy" to their friends and family in the process. Another person said s/he would feel more entitled when spending more money in being a more responsible consumer, which is clearly a motivationally and knowledge based action overcoming the financial systemic barrier in place. Finally, one individual became very motivated saying s/he were planning on brainstorming with friends and family, improving the recycling situation in his/her complex, and finally, to make greener purchases as he/she "build(s)" their bank account. Here we see changes in motivation, and attempt to change at least one systemic condition (recycling), and yet the repeating systemic financial barrier. Beyond these initiatives, this same person, who has recently entered the workforce, said that the course helped to open their eyes. From now on, (as discussed in Appendix III - *Employee Satisfaction and Quality*) s/he will be sure to factor in the level of responsibility taken by their employer, into their decision concerning where s/he will work.

Anticipated Colleague and Management Reaction
Most people automatically assumed that there would be a positive reaction within the company regarding the course and/or SD-related suggestions. However, one person came up with a very different picture. According to them, only 1/5 of the company would be supportive while the rest would find the ideas "frivolous or weird." Certainly, for those that took part in the research, there was a higher degree of positive feelings towards the course. However, it is possible that the more engaged or progressive employees wound up taking part leaving those who do not care outside of the research. If it is true that 4/5 of the company would be negative, then this could indicate a range of Norm Model barriers.

Telecom – Norm Model Analysis
State of Economy
For individuals working in a finance department, it was surprising to see how few people had a solid perspective on the economy and how it could impact their company. While two people seemed to put forth straight forward answers, one said s/he, did not know while another said that if the economy is good things will be good. This tells us very little about the systemic condition of financial flexibility or expectation around this within that company or how it would factor in if we were to begin thinking about making changes or dealing with sustainability-related expenditures.

Social Goals
While half of the responses addressed aspects such as "ethics", "honesty" and "higher moral values," others raised "profit maximization" and equipping niche markets as social concerns. Either people

were not paying close attention while answering the questions or they have a skewed perception of social issues.

Individual Environmental Action
Three of the participants highlighted taking environmentally-related action including recycling, toner cartridge refilling, and green transport recycling.

The majority did not see a major connection between the course and their environmental behaviour, with the exception of one person who found himself/herself thinking more about where products originate and how production impacts the environment.

Integrating Social, Environmental, and Economic Considerations
For those who made an effort to reflect on their company, after taking the course they either did not see or had trouble seeing how the different sustainability issues (i.e. social and environment) related to their company and sector. This is likely not a failure of the course so much as a lack of willingness to engage with the course which would have led to increased knowledge showing the existence of such a connection. One could see that there may be some employee issues to deal with. The same person stated that the course raised "interesting issues" that s/he had never addressed previously and that while people do not think about them the participant felt that one person can make change possible. This person, while demonstrating a higher degree of willingness, was the only one in the group to make a statement of this type, and furthermore, based on the answers, this individual still did not know how the course had impacted his/her life.

One action which was raised more than once was the donation of money to charity, and while one person said this made them feel good, it was unclear where the money went or if by giving this money the person felt as if s/he had "done their duty" to society and could relax after this.

3.4.4 Focus Group Discussion

Internet-related company
On August 8, 2005 the author co-convened a focus group[37] with the environmental manager and four other employees from the Internet-related company that engaged in taking the Chronos course. The thrust behind the focus group was to further reflect on their learning experiences and the Chronos course, but more importantly to take the experience to the next level in conceptualizing how they could take what they had learned coupled with their previous knowledge and experience to think of ways of making their company more sustainable.

The group scheduled to devote 30 minutes, however, as things ran well the group lasted for closer to 90 minutes. While the literature suggests that the moderator limit their input, in this case the researcher interacted extensively with the focus group providing a number of opinions and ideas while being sure to give all the participants more than enough time to share their own views. As this was meant to be an action research exercise, the researcher provided a number of ideas and questions and helped facilitate the discussion. Four days after the focus group, the participants were asked to share their thoughts on the process and how the course impacted the focus group itself and two weeks after the group, the main contact also submitted an update.

[37] See section 1.6.3 where the literature on focus groups is summarized. Furthermore, see Appendix VIII for additional discussion and output from this focus group (i.e. Reflection on Chronos, Transportation possibilities, and Computer possibilities).

Reflection on Chronos
In terms of discussing what kind of more generic customization could have been done in the initial development stages of the course, the group felt that individual company customization, while helpful, was not necessary. Instead, they felt that if the resources were available, simply identifying key sectors and developing multiple versions of the course with these sectors in mind could have been a very effective plan. Of course, as the initial development of the first version and any additional customization has been recognized as relatively costly, this would not be a simple process. However, if companies from the same sector pooled resources, producing sector-specific versions could be far more efficient. Companies could then use these versions immediately, or engage in far less dramatic further customization.

Norm Model Related Barriers
One simple discussion provides an example of how the main components of the Norm Model can act as barriers to positive change. The group raised the topic of their computers and the prospect of turning them off to save energy. First, the participants knew that turning a computer on uses significant amounts of energy in comparison to that used once the computer is turned on and running. As such, they were unsure if it made sense to turn off their computers at night or for the weekend, seeing as the next time they would need the computer they would turn it on and used a significant amount of energy. Perhaps leaving them on all the time would use a lesser net amount of energy. Next, some employees had been instructed to turn on their virus scan at the end of the day as they are leaving the office. As such, should they wish to comply with this request, they would need to leave the computer on when they leave. These first two issues raised uncertainty and highlighted their lack of knowledge, to know what the best decision would be in terms of saving energy. The initial perception of the virus scan indicates a potential systemic condition blocking the turning off of the computers at night. Through discussion it was thought that dependent upon the model, if a computer is left off for seven hours or more, it does actually make sense to turn the computer off every night. As for the virus scan, another employee who had not been told to necessarily run the scan at the end of the day as they are leaving, said that they regularly do scan their own computer, something which lasts all of five minutes. Clearly, a five minute scan could easily be done during the day and would not necessitate leaving the computer on all night. Finally, it was observed that there are employees who regardless of most circumstances would likely not bother to turn their computer off every night before leaving, indicating a willingness-related issue.

The knowledge-related issues needed to be confirmed (i.e. the length of time one needs to turn off the computer for the energy savings to make sense), however, this seemed like something that could be remedied with a simple inquiry to the 'tech-people'. In the opinion of this thesis author, in this case, the willingness issue could be overcome. In an office such as this, with strong environmental leadership, and with a task as simple as turning off a computer, it would be possible to establish this shift in behaviour. What is the trickiest component is the systemic condition of the virus scan. While it was thought by some that the scan was short, in which case this is not a problem, it had been a direct order from the 'tech-people'. If the scan was in fact not a short procedure, the systemic barrier, would be the biggest problem in allowing for behavioural change as one would have people understanding the situation and willing to make the change but unable to counter a direct order and system requirement.

Most significant environmental impacts
The meeting had originally been scheduled to last for 30 minutes and without guidance from the moderator the group could easily become side-tracked and/or remain on the transportation discussion for the entire meeting.

While the participants were not environmental experts, when challenged to think of the company functions which have the highest environmental impacts they quickly responded that they were likely transportation, something already discussed, and energy use within the office. This raised yet another major systemic condition that could block any attempted improvement; they are tremendously limited in terms of what they can do because the landlord who owns the premise from which the company operates, reserves the right to making many changes to the rented space. For example, while in the city it is possible to purchase 'green' power from the local energy provider, the landlord is the one who purchases the power for the building and is unlikely to pay the premium, even if it is a small amount, for the 'green' power. To this point a suggestion was made by this thesis author. When one buys 'green' power a premium is paid to the power company and more 'green' power is put into the system, not sent directly to the buyer. As such, it was thought that the Internet-related company could simply contact the power company, track their power use and contribute the appropriate premium that would be assigned to their power use, directly to the power company. While it was not certain this would work, it could provide a method of side-stepping the landlord and ensure that all of the company's power use was 'green'.

If they could take major environmental action through taking on both of their biggest challenges, energy and transport by ensuring 100% 'green' power usage and taking concrete steps towards improving their use of transport (i.e. 'green' vehicles, etc.) not only would they make major progress environmentally, but they could really start to push their environmental image in their branding and marketing. It was recognized at one point during the meeting that the company's past failure to communicate their core principles represented some type of loss. Greater engagement and more real actions demonstrating their principles would only improve what the company has to show to others.

This discussion, concerning key environmental impacts, raised important issues which are missing from the Chronos program. While the course does a good job at starting the learner on the path of taking action to implement greater levels of sustainability, it fails to help the learner focus, at least environmentally speaking. The course participants were not, without coaxing, thinking in a systematic manner. They did not think to:

1. focus on the company's greatest environmental impact (something they had no problem identifying when asked specifically;

2. classify the environmental impacts which can be decreased with the least effort (i.e. the lowest hanging fruit);

3. identify which changes would bring the greatest secondary benefits (i.e. cost savings, brand value, etc.);

4. break the assessment of environmental impacts into internal operations (i.e. internal infrastructure like printers, salesperson transportation, etc.) and into core business functions.

The final point is believed to provide a key distinction. It is very important at an intrinsic level that companies weave sustainability into their core business strategy if possible. If companies fail to do this, then they will be unable to systematically bring sustainability into the mainstream ensuring the health of our future society. The alternative will be more randomly placed and designed initiatives that will likely qualify as 'add-on's' while the main activities driving society and commerce will likely remain unattached from the concepts sustainability. These thoughts (i.e. low hanging fruit, importance of looking at core business strategy, etc.) can be summed up as balancing the easiest changes which could be made with the changes that will bring the greatest (environmental) benefit. These are very simple ideas which can guide behaviour, can be applied to virtually any operation in

any sector or at any scale. Furthermore, virtually all of these ideas, whether they are linked to low hanging fruit, core business strategy, etc. can also be applied to socially-related sustainability actions. Of course, beginning to balance all three, economic, social and environmental at the same time, does increase complexity but does not stop one from taking these simple ideas discussed in this section. The point is that these generic ideas are valuable, versatile and seem to be missing from the Chronos course.

Core business-related ideas

As much of what the company does is virtual, and due to the nature of the business, it is challenging to find ways of weaving sustainability into the core business structure. As noted earlier, the company with strong environmental leadership, stemming from the CEO's leadership, has already taken strides to bring environmental sustainability into the core of the company. In capitalizing upon what has been done and in growing its 'green' client base, and increasing knowledge both internally and outside the company, the group thought that they could create a lunch seminar series in which they bring in potential environment-business-related speakers. These speakers could simply educate staff or they could open it up to their other clients and/or the public, thereby providing the speakers/their 'green' clients more exposure and providing learning opportunities for all in attendance. Providing clients a chance to learn, make business contacts, and increase their exposure would 'kill multiple birds with one stone' and be directly linked to their core business strategy.

It was also recognized that despite the significant cost reductions they provide their 'green' clients to advertise, these clients/prospects are often 'poor' and still cannot afford to take part. The author thought that an effort could be made to create joint advertising opportunities between strong paying clients and prospective 'green' clients with less financial flexibility. While the two involved in the joint ad would need some sort of connection to justify the partnership, this collaboration could be orchestrated in a number of ways. First, the two involved in the joint ad could simply split costs. Next, the 'green' company could transfer their 'green' discount to the other company. In a more complicated scenario, the 'green' company could offer their product or service at a reduced cost or free of charge to the partner, who then could pay for the entire joint advertisement themselves. An example of this was suggested very naturally in the meeting. They already have a very well known chef who advertises and only uses organic meat. They also have made attempts to get a particular 'green' prospect whose business is supplying organic meat. The organic meat supplier could provide meat at a reduced cost or for free to the chef, who would then in turn, pay for a joint advertisement featuring their restaurant and the organic meat supplier with whom they deal. Interestingly, the company already collaborates directly with some 'green' clients under similar conditions receiving ink cartridge recycling, organic beer and green coffee in return, for example.

Finally, as the 'green' clients have less money, it was also thought that they could offer free ads to select 'green' prospects for a set amount of time (i.e. three months) to get them used to the service and then attempt to keep them one as paying clients afterwards. They were unsure how this would work as there is a cost involved with allowing ads to be processed, but could be profitable depending upon how many clients continued on with the service after the free trial period.

Chronos' impact on the focus group

Before soliciting the group's thoughts about the impact of the course on the focus group itself, many related factors seemed apparent which led to the conclusion that there was a positive connection. First, while the company has an environmental manager it did not appear as if those who attended the group had been engaged in environmental issues, at least in the manner carried out in the focus group. As such, the course and looking for 'next steps', created a context to bring the people together. Next, while there was criticism and the group members were told that no representative of the course was present and that the goal was to have them speak freely either positively or negatively, there was

general consensus that taking the course was a positive experience. Additionally, through completion of the questionnaires and during the group discussion, it was illustrated both explicitly and implicitly, that the members had rarely or never had the opportunity to explore these ideas, in this manner. Participants throughout the research repeatedly talked about how the course generated motivation if not actual changes in behaviour. Finally, a meeting that had difficulty to gather five people and was scheduled to last 30 minutes, in fact lasted almost three times as long due to the interest. It seemed highly likely that the course had a positive impact, first on the individuals, then on the group meeting, and finally, on the group's ability to create and develop new ideas that could potentially bring business to the company, if not at least make it more sustainable, in the long run.

Besides going on logic and looking for signs of connections the focus group participants were asked afterwards how they thought the course impacted the process. Not all participants were certain that the course had a material effect upon the focus group. One individual thought that the same ideas would have been raised in the group without having taken the course. Still, they said that the process was "helpful" and that the group interaction helped to "reinforce" the ideas they drew from the course. As a result, they thought that this process should be carried on with other groups.

Another participant had an even more positive message stating that s/he felt

> "that the Chronos course got the mental wheels turning in terms of ways that individuals within a company can make a difference in terms of sustainability. I suspect that for many of us, environmental issues affect some of the choices we make in our daily lives, but we may not feel empowered in that regard in the workplace, or (we may) feel that someone else is responsible for dealing with those issues, not us. So (as a result of:
>
> a) taking the course;
> b) by following up with a meeting where everyone's suggestions were both expected and appreciated;
>
> I feel that people were more empowered to take initiative/responsibility for the environmental performance of their work and our company as a whole, which is terrific."

Several weeks after running the focus group, the Internet-company's contact reported significant action which was "sparked" by the course and focus group, thus, concluding that the experience was "very successful" (see Appendix X for the exciting results). In light of the great progress, the contact was asked if this action was being tracked and if the saved money, increased revenue, saved time, increased employee satisfaction, etc. were all being tracked. While this was so simple and the contact realized that it was the most logical thing to do, they had not thought to do so. As is the common statement in management literature, 'What gets measured gets managed.' Beyond better management, it helps build the case for further efforts to be made within the organization or to convince other 'non-believers' to become involved. This is yet another simple point that could have fit nicely into the Chronos course. While some doubts remain regarding the extent, there was a positive interrelationship between the course and the focus group, each improving the positive effects of the other.

3.5 Further Chronos Critique

The following are additional observations made concerning the Chronos course.

As one of the focus group participants stated, s/he felt the course was directed at the individual first, and not the company, the developers did a good job in getting the learner to connect by making the experience personal. This was achieved in a number of ways including the coaxing of the active reflection of the learner's personal values and providing interesting details laden with shock value that connect to products the learner is likely to use on a daily basis.

The course does a good job at helping to provide a positive vision of the future which can help to maintain the learner's engagement and provide hope and inspiration.

It was smart for the course developers to begin with "The Facts" section which sets the context for business people by discussing youth dominated market trends and resources that are vital to business such as water which is, for example, disappearing in some EU cities and in many parts of the world. These points help to make the topics to be discussed relevant to the learner and 'hits close to home'. The quiz in this section was very well done in that it was interactive, simple, clear, and included important information. Furthermore, it was responsive with analysis of the learner's final results.

The course discusses the key roles businesses play in our society and in relation to various sustainability issues, which is important. However, they fail to mention the related discussion about the need/possibility of expanding markets, etc. that can go hand in hand with playing a wider role in our society. Inclusion of these thoughts could be seen to be in bad taste, and yet, it is some what surprising that it was left out.

The course makes good use of figureheads and experts to grab the learner's attention and to legitimize the discussion. In one case, the course included of ideas from an individual, Bjørn Lomborg. This is good for balancing out the gloomy environmental picture as Lomborg provides a more positive view. However, this runs the risk of damaging the course seeing that there has been great controversy surrounding this individual; which is also not recognized in the course.

The section entitled "See what others think" where different key figures define SD was done very well, however, this could be improved with some sound bytes and/or short video clips.

The "showing the way" interactive map is a nice concept within which they provide company stories from around the globe with a positive spin. This is one of the places where they seem to be getting a little too company friendly. For example, the Brazilian story talks about planting eucalyptus. It is conceivable that one could find an individual who would say there are some invasive species concerns surrounding this. This section ideally would discuss how companies can/need to change their core business strategy, as opposed to simply showing positive, one off unsystematic examples.

The part called "the story of your computer" which so many participants have pointed out as something they related to so strongly, was well done, but long and full of text. If it were possible it would be much better to use animation or do a short video to keep people interested.

The "working principles" section did well to be inclusive, raising issues such as the 'Polluter Pays Principle' and the 'Precautionary Principle.' While this section, the role plays and the Sustainable Development Dilemmas for example, seem to touch on issues like externalities not being included in pricing or competing with a level playing field, these issues could have and should have been dealt with in a far more high-profile and effective manner. Either learners are going to recognize this

deficiency and can ignore the material in the course as a result or proceed with potential changes and be blindsided by these potential threats.

Once again, the role playing/'choose-your-own-adventure' which so many participants appreciated is very enjoyable and interactive. However, if one follows one of the possible paths it turns into quite a rosy finish leaving the learner wondering about how the company would have dealt with the significant costs and commitments left unaddressed in the scenario.

The section called "the value case" was very well defined. However, afterwards "the corporate response" section attempts but does not entirely address the slippery slope that some business people perceive CSR or SD to be. Later "the business case test" section totally drives the discussion in the opposite direction away from slippery slope concerns. This failure to not only miss directly addressing such a crucial issue, but to steer the learner in the other direction puts the entire learning experience at risk if this issue concerns the learner and leads to a less convincing overall argument.

The "influence and action" section is somewhat general, but provides a very necessary function. It is very good that this section helps to walk the learner through potential implementation of sustainability ideas within their company in a step-by-step manner.

The end of the course provides a solid listing of resources for the learner to expand their knowledge.

While the course facilitates a significant degree of self and company reflection it does not do a great deal to test what the learner has gained through completing the course. This can be a good thing in that the learner may feel more comfortable going through the program which they will perceive as being less judgemental. And yet, without proper assessment, they may themselves not realize what they have learned, they will lose the opportunity to reinforce what they have learned, and the company could go without knowing what value they and their employees have gained through engaging in the course. The company is recommended to provide some type of follow up, at which point, the employees' understanding may come through. However, it could not have hurt for the developers to have created an additional optional section which was to focus upon what the learner had gained.

In general the course provides a valuable learning tool, which is creative, polished and well-organized. At the same time, it seems to be a little too closely aligned with the business community, which could be expected. It is not able, in a number of ways, to achieve second generation status due to factors such as the linear layout, the lack of granularity, and the lack of further learner-control, of which there is already a relatively strong level.

4 IIIEE's ICP Course[38]

The preceding chapter examined the Chronos case study. This chapter highlights key facts and experiences recounted by a developer of the IIIEE's ICP course. While the ICP course is very different from Chronos, this provides us with different perspectives on how a sustainability e-learning course can be delivered.

The course, Introduction to Cleaner Production (ICP), developed by the IIIEE, is approximately a 200+ hour, part time, 10 unit distance course designed to facilitate a societal approach centred on cleaner production. The course has three objectives in three areas; knowledge, skills, and attitudes.[39] The course uses a wide variety of tools and mechanisms including web resources, role playing, multiple choice testing and report writing to achieve these objectives. (IIIEE, n.d.)

Resources for development
To deal with the pressures surrounding resource availability, the ICP course emphasized human interactions and to leverage relationships with experts who were not paid to be involved in the course. The developer found that placing greater focus upon people as opposed to technology was more efficient, and at times, led to additional positive initiatives. This is interesting as Inglis et al. (1999, pg. 38) in section 2.2.1 state that low tech options are often used as they can be cheaper and more reliable. Perhaps, at times, these options can also be more effective.

The course takes an interesting approach to ensure the students are committed and that the resources 'spent' on them, are well invested. The learners work on the initial set of units relatively independently[40] and complete this with a take-home exam. Successful students are then allowed to continue with the course, receiving much more "teacher/tutor time". (Eneroth, 2005, August 30)

Mistakes
Eneroth states that one of the greatest errors was "to underestimate the time it takes to build a functioning web-community"…(which includes) "booking external resource persons, communicating dates to the course participants, adding news features and making assignments self-explanatory with templates and links." This discovery is directly in line with what Garrison et al.'s (2003, pg. 78; in section 2.2.1) have said. However this unexpected time commitment has led to very positive results.

Surprises
Eneroth stated that the greatest surprise has been to find that one can successfully execute an academic course internationally through the Internet, even without the participants ever getting a chance to meet in person. In fact, he has found that this form of delivery has achieved similar results regarding academic quality and forms of interaction in comparison to traditional classroom delivery.

Pedagogical Approach
The developers were challenged to find an effective pedagogical approach. They determined that they are best to provide support by facilitating the sharing of experience on the part of the course-takers. They say that it will not work to simply assume the content is good enough on its own or that the course will function without support and guidance. Of course this sounds similar to what Fox (2001, pg. 58; section 2.2.3) said earlier about shutting students in a room and telling them to "get on with

[38] Virtually this entire section is based on Eneroth, 2005, August 30.

[39] Notice the similarity between the objectives and the Norm Model.

[40] They participate in two electronic forums and have e-mail contact with other students during this time.

it." Furthermore, the developers have said that the course leader must "sell" the course to the participants repeatedly by "combining challenging tasks with encouraging words and building personal relationships with each and every one." Perhaps this fits with Madden's earlier discussion regarding the major issue of communicating the course to buyers and course-takers, not to mention, helps to explain how time intensive running a course can be.

Online Interaction

For all of the challenges discussed in section 2.2.3 regarding the online communication, the ICP course has only encountered minor incidents which have all been solved, often simply with utilizing common courtesy as "an effective medicine." Eneroth stated that frequently, course-takers who do not necessarily understand cultural differences beforehand, often make the effort to "first understand and then (to) judge." It is encouraging to hear that a course could run for years with this type of online interaction and fails to encounter any significant problems, and that participants frequently seem to be able to overcome the cultural barriers that can be very divisive.

Learner-control vs. teacher-control

Eneroth stated that teachers will typically deliver their course in a manner which follows their thinking and style, and as such, can prefer course-takers who have similar thought patterns. To deal with this, he stated

> "what does work is to provide a wide variety of ways to interact with the course material, such as electronic discussions, open-ended assignments, specific reading assignments, one-to-one conversations, traditional exams, field studies, etcetera, and giving them equal importance. Catering for different learning styles increases the chances of finding at least one favoured way for the student to engage in deep learning."

Interestingly, this is one of the major suggestions to be put forth in this thesis, to provide course-takers with multiple options and techniques for learning. Obviously, simply providing diversity in this manner is no guarantee of learner-control, however, it can make the course more interesting in terms of providing choice and varying approaches, meet various learners' preferences, and if well-crafted, lead to greater learner-control.

5 Conclusions and Recommendations

This chapter draws together the lessons learned through looking at the learning process, e-learning, the Chronos case study, and the other courses assessed. These conclusions then feed into the recommendations for e-learning developers and areas for further research.

E-learning has great potential, has accomplished some impressive feats, and yet has in many ways failed to meet the great expectations it inspired. Billions around the world require effective education if they are to be properly equipped to make an attempt at making our society and our world more sustainable. E-learning has the potential to reach many of these individuals, provide effective learning opportunities, cater to specific learning needs such as those found in universities and corporations, and finally, improve other existed learning experiences. Unfortunately, it appears as if efforts to develop and study e-learning as a medium, and to share and build upon others' lessons has fallen short; this can be an important contributor to the failure to meet expectations.

5.1 Learning and the literature

The literature provides a complicated jumble regarding the issue of learning and behavioural theories. What seems to be the best option is to draw valuable generalities that seem to apply to many, if not large groups of learners that are grounded in real experience and repetition found in the literature coupled with the empirical results found in this thesis. For example, it is important to keep in mind that socio-emotional factors play a major role in learning, whether they be the cultural context or the impact of the learner's peers (Boud, Cohen, and Walker, 1993, as cited in Alexander et al., 2001, pg. 7). It is important to trial each program extensively, always being prepared to make adjustments as the development and delivery of the program continues. Finally, as ESD can be thought of as highly soft-learning related (i.e. incorporating 'soft' skills such as interpretation), understanding how to deal with this type of learning essential to creating effective learning that will produce action for SD.

5.2 Research Questions

1. What are the general strengths and weaknesses of e-learning courses and programs?

2. What conditions, approaches, tools, and methods can be used in e-learning courses?

E-learning has the potential to provide cheaper course development costs, faster transfer of information, and superior options such as improved interaction between student and computer, student and teacher and student and student. E-learning can provide for significant flexibility regarding issues like place of learning, time learning takes place, the pace of a learner, and where the learner enters and exits the learning experience. (Inglis et al., 1999, pg. 18, 34-35) Finally, the medium can provide rich, responsive material, and a learner-controlled environment which has been seen as potentially exceptionally important in this thesis (Morgan, 2001; Alexander, Shirley and Boud, David, 2001, pg. 9). While it can be a challenge to provide, learner-control can be facilitated, for example, through well-planned sequencing, leaving decisions to the learners, allowing the learners to control the pace, etc.

There are a wide range of potential challenges which often are highly dependent upon circumstance, the learner(s) and teacher involved, etc. E-learning is often far more resource intensive to prepare, and potentially can continue to be draining during course provision (Garrison et al., 2003, pg. 78). As such, it is important that developers know what they are getting into and plan accordingly. Shifting from the traditional classroom to e-learning represents a major shift for both teacher and student. It is

important that neither is just 'thrown' into the new medium, that it is ensured students are able to create or be provided with motivation, and it can be good to ensure that learners understand how to learn in the new context. (Flood, 2004)

A diversity of learners can present a major challenge to developers. It is essential that the developers know their target group(s), ensure that their material(s) are designed for broad appeal, and provide a variety of methods of learning which will allow learners to select the method most suited to their abilities and preferences.

E-learner behaviour can be entirely unpredictable with learners failing to follow the developer's prescribed order. Again, this connects with learner-control. As such, this must be kept in mind during development. Providing "byte-sized" pieces of information or granularization, and a non-linear format can help with this. (Caroll, 1990, as cited in Hills, 2003, pg. 80, 82; Hills, 2003, pg. 84)

Developers will always have more good information they wish to include than can or should be included. However, it is very important that they constantly attempt to reduce the amount of content to keep learners engaged and learning effectively. (Garrison et al., 2003, pg. 67) It must be noted that the manner in which the same material is presented can make the addition of content more palatable, and even more powerful.

Communication with learners and/or buyers of e-learning is key. Realistic expectations must be created and understanding of what is included and how it is to be used is essential. (Madden, 2005, B) Courses require both marketing and adequate support. (Flood, 2004)

Standalone e-learning is suited to service a large market, can work well where flexibility important, and has the benefit of potentially placing everything in terms of the learner (Inglis et al., 1999, pg. 95). However, this format faces many challenges as the learner can be 'alone'. Developers, once again, need to know their learners well, and may in the course, attempt to mimic a real teacher. So long as it does not get in the way of learning, providing entertainment through the course, whether using humour, games, or visual stimuli, which is seen as particularly important, can be beneficial in all sorts of e-learning, including the standalone format. (Hills, 2003, pg. 56, 57, 17) It can be more difficult in this format to create excitement or a sense of pressure, as, for example, there is not a group of people depending on the learner. If it is possible, combining standalone learning with integrated or blended learning can be ideal. While learning involving human interaction is likely superior, the literature and experience with the Chronos participants shows that at times the standalone format can avoid a number of obstacles, provide a variety of benefits, and potentially, satisfy learners who may not feel they need additional human interaction which can be more challenging to organize.

Online human interaction can be both beneficial and simultaneously provide an array of challenges. If it can be provided, the presence of community[41] can be very helpful in the learning process (Garrison et al., 2003, pg. 48/49). Whether in synchronous or asynchronous interaction, social cues can be lacking which can negatively influence relationships, and yet, there is evidence that learners have at times found ways to substitute these signs (Garrison et al., 2003, pg. 48; Rourke and Anderson (in press) as cited in Garrison et al., 2003, pg. 49/50). It is interesting to note that it appears the IIIEE ICP course has managed to overcome any challenges regarding online communication. Regardless, a teacher faces a different and challenging role including all of the 'old' jobs and new tasks when overseeing online communication (Garrison et al., 2003, pg. 65). This can be very time consuming as

[41] In this case community refers to the social interaction between the learner and other live 'classmates' and/or a live teacher.

the teacher must stay on top of things and yet must balance direction, order and the ever important learner-control.

There are different social impacts that are important in e-learning. For example, people can get angry with computers even if they are inanimate objects (Hills, 2003, pg. 54). It is important that they know what to expect and what to do when the system does not function properly. They must also be able to expect there to be no technical problems or to receive support with solving them when they do occur along with available general support. Feedback is extremely important in learning and there can be advantages and challenges when either the computer or a live person provides this function. Live person-provided feedback is likely superior for many reasons such as the greater flexibility and judgement that comes with this option, and yet, a computer can seem more neutral and put less pressure on a learner, letting them feel more relaxed.

Learner evaluation is very important but can provide challenges. Teachers/computer programmers may wish to give learners space and may want to avoid declaring the learner's answers to be 'right' or 'wrong'. It is essential to separate whether it is the student or the program which is to be evaluated. Evaluators must know:

i) what it is they will evaluate;

ii) when they wish to evaluate;

iii) how they wish to evaluate;

iv) who will carry out the process. (Inglis et al., 1999, pg. 126)

Morgan differentiates between three generations of e-learning. The first generation, effective at facilitating technical learning, initially began with transferring simple content so that it could be accessed online. The second and third generations, which are more effective at facilitating soft-learning, involve programs which allow for learning on demand, significant learner-control and facilitates "complex simulations" and "virtual classrooms". (Adams and Morgan, 2005, pg. 24, Morgan, 2001; Morgan, 2005, August 5)

Morgan has developed 13 questions that should be used as guidelines to improve individual e-learning courses. For example, it is important to know what kind of services the program provides along with the level of granularity[42] of the material for easy location and digestion. (Morgan, 2001)

Developers are challenged when it comes to providing flexibility for the learner. Different learners, perhaps at different ages or in different cultures may be accustomed to learn in more passive or more active manners. (Morgan, 2005, August 5) Active learning, according to Laurillard, is very important, but if you have an ingrained passive learner in mind, you may not develop the program in the same way. Once again, it is important to know your target(s) and to provide multiple options for learning within the same course.

[42] Here the level of granularity is in reference to the manner in which the information of a course is provided. A high level of granularity signifies that the information is broken into "bite-size" pieces or granules as opposed to long sections of text, etc.

3. How does Laurillard's work relate to e-learning regarding the provision of effective e-learning courses?

Laurillard makes it clear that learners need to be actively engaged and that their learning must be 'situated' in context to optimize the experience. Situation of learning is especially important when dealing with soft-learning which requires interpretation and context. As a result, ESD can be thought of as highly soft-learning related, making understanding how to deal with this type of learning essential to creating effective learning that will produce action for SD.

It is believed that the more of the criteria and strategies highlighted by Laurillard, which a course meets, the better the chances that the course will help to ensure successful learning. The tools heavily focus upon the roles played by the teacher and the learner. While the provision of person-to-person communication, at least between learner and teacher is irreplaceable in an e-learning course, such communication faces significant challenges. Some of these challenges are found in any social situation while others are unique to or are exacerbated by the realities of synchronous or asynchronous e-communication. What has been seen is that even with the great challenges facing e-learning, the Chronos course uses clever and creative solutions to help overcome various issues and to improve the learning situation for those who select to work through the course.

It appears that developers of a standalone e-learning program will encounter significant problems in meeting the many of the components within Laurillard's teaching strategy. Clearly, effective feedback and communication factor heavily into this strategy, and yet, it is more difficult to include these in standalone learning. Laurillard's work shows that a strong relationship between a live teacher and learner(s) is very important; deliberate 'testing' of learners' understanding and feelings should be done regularly to ensure that essential communication occurs regularly. Dependent upon a number of factors, such as what previous knowledge the learner brings and the reflexivity of the program, it can be difficult to account for Laurillard's key mathemagenic activities[43] in e-learning which could hamper the effectiveness of an educational program. The key lesson here is that the teaching strategy and mathemagenic activities can help provide a useful guide when gathering and comparing course provider's and learner's perspectives on the 'class' experience.

Laurillard's tools and materials help to highlight a range of important realities and requirements such as the imperative that any e-learning program developers carry out extensive target population research before program creation and during use. Such research will allow the developers to prepare more appropriate materials and make the required revisions. Laurillard's work clarifies the need for providing for greater flexibility in meeting the students' needs. This flexibility also comes into play in connection with the theme of learner-control discussed in these conclusions. Some examples of this flexibility may include allowing the learner to:

- modify action;
- manipulate forms of representation;

[43] These mathemagenic activities include, for example, 'apprehending the structure of the discourse' and 'interpreting forms of representation'.

- execute active hypothesis testing;
- gain access to an open structure that allows adaptation to feedback (this applies to both students and teachers).
- generate, send and receive effective feedback; this is essential and is also important for the teacher.

Testing the adequacy of feedback could be helpful; this can be done through systematically checking students' conceptions and feelings, possibly through using an anonymous feedback system.

4. What are the strengths and weaknesses of the 'Chronos' course and how the weaknesses can be overcome?

5. What insights can be gained about the potential educational effectivity of Chronos by evaluating Chronos learning participants' experiences through the lens of the Norm Model?

It is clear that many of the case study results, involving Chronos, whether they regard the developers' experience or the Chronos course-takers' feedback, are in agreement with the reviewed literature.

Developers Discussion
The Chronos developers were unpleasantly surprised to find fewer companies and individual people than anticipated use the course and are frustrated by the extremely slow process from the beginning to the end of a sale. They have faced challenges in communicating with both the buyers and learners, the latter of which initially received the most forethought. The developers have brought users and potential users together, provided suggestions of how to use the course, how to integrate company information and how to incorporate the course into blended learning to make use of the course more effective and to increase the number of people who take the course. They are also in the process of creating an implementation guide which they hope will help to encourage companies to choose to use the course and to help them make progress on their individualized corporate SD journey.

The developers see that while it is essential to have executives buy into SD, it is necessary to also bring in mid-management; Chronos is designed to help with this process.

The developers were challenged in developing Chronos due to the diversity of its potential users and the diversity of ways users may engage with the program. As such, the developers attempted to make the course quite flexible and provided methods of tailoring the course through customization, which they state can be important. The language of the course is a key issue. First, the WBCSD membership represents people with a wide range of languages and yet the course is only currently provided in three languages (English, Spanish and Portuguese). Furthermore, customization can be very complicated when it comes to translation and related re-design.

The developers recognize that all companies are at different stages of their SD journey and that giving the course too soon or too late on this journey can lead to negative results.

While the developers expect Chronos, in a standalone format, to provide a list of benefits such as fostering enthusiasm for SD and provoking reflection, they advise against this format due to potential problems. They feel that this could lead to disorientation and leave the learner feeling unsure as to what steps they should be taken.

Laurillard Tool Analysis (LTA)
Using Laurillard's tools we see some key benefits of and challenges to the Chronos program. For example, LTA helps to inadvertently highlight the highly creative manners in which the course provides interesting feedback for the learner, as this function, at times, seems to substitute for the various teacher roles that Laurillard discusses. LTA does bring to light the inability of the computer/course to carry out complex reflection on learner provided feedback.

Laurillard's teaching strategy indicates that the addition of a 'live' teacher who incorporates good communication and program flexibility can ensure significant improvements, something that could be predicted beforehand without any major analysis. Interestingly, few participants who engaged in this research with the Chronos course actually mentioned anything about interest in having the opportunity to work on the course with a teacher or with other learners. Learners do not always know what is best for them, and yet, perhaps, if design is creative enough, a course can 'get away' with providing a standalone format.

It is believed that LTA provides a good guidepost for the development of further research designed to investigate and to compare teacher and student experiences in traditional and in e-learning course contexts.

We see that key benefits of Chronos, such as its polished nature, quickness, creativity, potential ease and appeal are not adequately evaluated when simply using Laurillard's criteria. This is, in no way a negative reflection on her work, as the tools are designed to address specific key aspects. These criteria provide a valuable tool to take the next step in analyzing the course through assessment of teacher-student conceptions and experiences. Finally, such analysis is strengthened by taking into account the various other lessons and tools, such as Morgan's 13 questions and Sims' proactive e-learning assessment, which are not explicitly highlighted in the work taken from Laurillard, which is discussed in this thesis.

Chronos Participants
IIIEE students
These students are at the phase in their educational journey that they will soon be expected to be SD experts; thus their analysis of the course was valuable for this thesis author.

For the most part, the students all came up with the same general themes through the course. When looking at how they learned, this author observed strong connections with what was seen in the literature. Repeatedly, the learners stated their preference for the tasks which allowed them to interact, take action, and connect personally and ideas with particular contexts. From this it is clear that active engagement, situated-learning, and learner-control are all features which are essential. Some students said that the real-life examples and "facts always remain(ed) deeply in mind"; this represented further situated learning.

The students found the varying methods of delivery to be refreshing. There was conflict over the issue of the text, with some stating that it was well designed and others stating that there was far too much text. This same split seemed to come to play amongst the different groups of participants. For those complaining about the length, this connects with Morgan's discussion of need for a non-linear format and greater use of granularization (Morgan, 2001).

One learner stated that during particular questions it felt as if there was "an actual teacher" with you asking you for the answer and for your justification of your answer. This is interesting when looking at Laurillard's tools which strongly suggest the need for a human teacher to be involved in the learning process. While this example by no means even begins to prove her recommendations to be

wrong, it does open one to the fact that in the absence of a human teacher, one may be able to construct a virtual teacher that helps to improve the learning process. It also leads one to question what this could mean for independent learning/ learner-control. Is it possible to have passive and active learning at the same time?

A few students thought the course was a form of public relations work or advertising for WBCSD member companies who may be engaging in potentially damaging practices which could be seen as the antithesis of SD. Certainly some material and its implications are questionable. Dependent upon the validity of this concern, it becomes more important for the learner to be active as opposed to passive. Related to this discussion, using well known brands or products can help situate learning and to bridge the gap between the learner's reality and distant places and problems. However, if the learner is suspicious of the examples, this can weaken or threaten the learning process.

The Norm Model analysis revealed some very interesting results. It was found that the participants from the wealthier countries had more jobs focussing on environmental matters in comparison to their LDC counterparts. Also, the participants' companies' social goals were highly dependent on context, such as whether the company was located in a wealthier country or not.

In terms of individuals taking environmental action in the past, there were two clear groups. There were those who had limited their actions to activities such as recycling and taking public transport while the other people had taken much greater action such as planning related conferences or initiating internal waste separation programs. Frequently, efforts towards environmental change seemed to be blocked by systemic conditions, meaning that all the knowledge and motivation in the world would not permit change to take place. There was also a problem with people not valuing their "small" actions which can add up to big changes.

Some people admitted to having trouble maintaining or remembering to engage in particular 'green' behaviours. Virtually no one in this relatively progressive group had made a consistent effort in the past to integrate all three pillars of SD into their personal and professional decisions, and few said that this would change in the future. This is particularly concerning. If these people are not integrating the pillars of SD into their lives and do not plan to, then who can be counted on to do so and attempt to bring our wider society closer to sustainability.

There was recognition that without a solid base of knowledge, nothing is possible, and some thought that they would have improved arguments to use as a result of the course.

Generally, the students were positive towards the course and yet concerns were presented about the course, not to mention some of the indications regarding the type of action the students do or do not plan to take.

Internet-related company
The thesis author did not know prior to the research that this company already had strong environmental leadership. As a result, its participants seemed to virtually ignore the social pillar of SD in their responses, regarding their experiences. They found that the course refreshed or took their SD thinking and motivation further. Afterwards they had a new appreciation for considering different stakeholders. In particular, the role playing was seen to be effective, both in providing situated and potential double-loop learning.

Only one person raised the prospect of incorporating interpersonal interaction to the course. This is very interesting as interpersonal interaction comes off as such an important feature in the literature and in Laurillard's tools.

Through Norm Model analysis it was noted that amongst the participants there are two group; those who do virtually nothing to reduce their and their company's impact on the environment and those who do smaller things like recycle. Interestingly, the company's strong environmental action led one person to feel their efforts to be belittled and some to feel like they did not need to bother with putting out more effort as a result. It is potentially concerning to see such an environmentally active company still with employees so unengaged. You will always have individuals in society or in a group who will 'do their own thing.' However, if those working closely with those who are particularly committed and still fail to put in any effort, how exactly will any other company without those positive examples present ever take any initiative to infuse sustainability into their practices.

The focus group highlighted transport and energy as the most significant environmental impacts, and yet, almost no one in written responses raised these factors.

Some were seen to have newfound motivation and who plan to make greater effort to purchase 'green' products and who will feel more secure more secure in making suggestions at home and at work.

Interestingly, while almost no one has made explicit efforts, in integrating the three pillars of SD, some say they fail to do so because it is too expensive, while others say they are forced into more sustainable forms of behaviour at times because they have so little money and have no choice as a result.

It appears as if knowledge is the easiest Norm Model component to deal with while the biggest problems are in reference to motivation and systemic barriers. At least the course did seem to help with motivation.

The focus group was meant to reflect on what was learned and to brainstorm how to make the company more sustainable. The group thought that sector-specific customization could be good as opposed to simply customizing the generic version of the course for individual companies. They thought that this would provide the necessary level customization. It is also noted that companies within the same sector could pool resources to deal with this and avoid, or at least, make company customization easier.

During the focus group, without guidance, the participants missed most significant environmental impacts, the potential low-hanging fruit, and systematic analysis of what to actually do. While they are not experts, when asked pointed questions about these factors, they generally knew the answers. Weaving SD into core business strategy, double-loop learning, and measuring the impacts of changes were also generally missed. All of these extremely key factors to SD seemed to come across in a cloudy manner, or were totally missed in the Chronos course. These are some of the most important results regarding the research on this course. It is thought that this is likely to result in unsystematic add-ons failing to truly lead to major change, and likely dwarfing all of the individuals' "small" actions.

Interestingly, the Chronos course's section on 'Values and Behaviour,' states that there are three factors influencing peoples' behaviour. These factors include; the way in which they think, their values and the life/work context. Notice the connection to the Norm Model which includes understanding, willingness, and systemic conditions. It is thought that explaining Norm Model analysis could help participants better understand their situation, improve how they attack problems, and ultimately, bring about more effective change.

It appears as if the course had a positive impact and the focus group used and improved the learning process which began with the course. Overall, the entire experience has led to significant, ongoing

and lasting change for sustainability. Yet, initially, tracking the changes and benefits of these changes was totally missed. This represents a crucial step and the Chronos course could be improved by covering this part of the process in a better manner.

The Telecom Company
Generally, this company showed poor performance regarding their participation. Even though the they participated poorly, they still highlighted helpful learning features found in the literature such as situated learning, immediate feedback, etc.

They also found problems with the length, which ties to Laurillard's discussion of 'book' learning being difficult for learners (2002, pg. 12/13), and Morgan's points regarding learner-control, non-linear presentation, and granularization.

Chronos research participant conclusions
While it is difficult to gauge the extent to which participants follow through on the 'smaller' actions (i.e. recycling, public transit), they seem to be prevalent amongst all of the groups who participated in this survey and yet in spite of their regular action, our world seems to become more unsustainable by the day. People, particularly in the Internet-related company wrote repeatedly of how the course made them realize that small actions can have significant impacts. This is entirely true, and perhaps, it is the motivation and ripple-effect impacts of those actions which are most important and can grow. However, we as a society do not seem to be moving closer to sustainability in light of these actions, and so many other more significant steps and such as attempting to institute new recycling systems, seemed to be blocked repeatedly by systemic barriers. While giving people real things they can do, such as recycling and building broad-based understanding and support which can lead to higher level change is key, it seems apparent that we require dramatic systemic changes which will be hard to achieve, with simple, individual, distributed efforts throughout the system in random companies in different sectors. It seems challenging to even get people making the 'smaller' efforts. Not to be negative, however, what good is it if they are on the top deck of a sinking ship where they only see a slight flow of water which they are using a spoon to bail. If the lower decks are completely filling with water, it does not matter how pleased people are with their spooning of the little water they see. Eventually, they will wind up going down with the ship. We need to find a way, to at least get people thinking about and understanding the various sustainability issues, but then empower them and enable them to see the bigger picture and focus their energies at making larger systemic change, or they will be confined to spooning out the little water, or worse yet, sitting on the top deck in the sun assuming that the deck hands below will take care of things.

Chronos critique
The course needs more focus on issues such as externalities not being included in pricing or the challenges not competing with a level playing field. People will think less of the program or will be caught by surprise running into these issues if they are not covered in a better manner. The course also fails to properly address the slippery slope that some business people perceive CSR or SD to be. Where does a company's responsibility begin and end?

In general the course provides a valuable learning tool, which is creative, polished, well-organized, and seems to have some ability to generate motivation. At the same time, it seems to be a little too closely aligned with the business community, which could be expected. It is not able, in a number of ways, to achieve second generation status due to factors such as the linear layout, the lack of granularity, and the lack of further learner-control, of which there is already a relatively strong level.

Finally, Chronos could do a better job in showing learners how to do the following:

i) identify the most significant (environmental) aspects;

ii) identify low-hanging fruit;

iii) approach the opportunity to make potential change in a systematic manner;

iv) weave sustainability into the core of whatever context is in question;

v) show learners how to and the need for engaging in double-loop learning;

vi) identify which changes would bring the greatest secondary benefits (i.e. cost savings, brand value, etc.);

vii) follow and measure the impacts of any changes made.

6. What insights can be obtained by evaluating other sustainability-related courses that are more or less directly linked with e-learning?

Various lessons were drawn from Morgan's 13 questions which have gone into a new e-learning course that is currently under development and used in previous conclusions such as the importance of active learner engagement and situated learning. The TNEP's experience with developing the ESSP materials showed that their greatest challenge had little do with content and was linked to a need on the part of some higher education professors requiring greater guidance and tools in providing effective learning experiences for their students. This leads one to wonder how many individuals teaching at the higher education level fail to provide effective learning experiences for their students, regardless of the topic or physical location.

Discussion of the IIIEE's ICP course was particularly fruitful. It was interesting to see how the ICP course placed more emphasis on human interactions than on technology.

It was good to hear about the developer's biggest surprise, in that he was able to successfully create a functioning online community that works at great distances. This helps to give hope as we have seen many potential barriers can block such establishment.

In terms of pedagogy they have encountered many approaches which do not work. Their experience has led them to believe the best approach is to provide support by facilitating the sharing of experience. The course's success in establishing positive human interaction is particularly interesting in light of the discussion in section 2.2.3, where a wide range of problems associated with online interaction are discussed.

The developer stated that to engage with different learners and to provide learner-control what does work is to provide a wide variety of ways for the leaner to interact with the course material. Before hearing this, this was to be one of the conclusions of this thesis.

5.3 Closing Statements

E-learning holds tremendous potential, much of which, we still can only imagine. It is an exciting time to be at the beginning of any field, and with the future of our species and planet at stake, this only increases the ante in our pursuit for providing widespread effective learning opportunities and spurring change around the world. We need to discover a new world and may this thesis provide a small block, but a block none the less, in the foundation of this new world.

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Abbreviations

ESD	Education for Sustainable Development
ESSP	Engineering Sustainable Solutions Program
ICP	Introduction to Cleaner Production and Sustainable Development
IIIEE	International Institute for Industrial Environmental Economics
MDG	Millennium Development Goals
SD	Sustainable Development
TNEP	The Natural Edge Project
CPI	The University of Cambridge Programme for Industry
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN DESD	United Nations Decade of Education for Sustainable Development (2005-2015)
WBCSD	World Business Council for Sustainable Development

Appendix I - Agenda 21 and the UN Decade

Looking back, Agenda 21 created during the 1992 UN Conference on Environment and Development or 'the Earth Summit', stressed the key role that education would play in development that respects the natural environment. Agenda 21 is a plan of action for individuals and organizations around the world to engage in creating an environmentally sustainable planet (United Nations, 2004). In fact, the word 'education was written separately or in combination 486 times throughout the Agenda 21 document (Wickenberg, 2005, B). By 2002, previous to the World Summit for Sustainable Development (WSSD), the UN Millennium Development Goals (MDGs) had been launched which include "the set of internationally agreed upon targets for reducing poverty, hunger, disease, illiteracy, environmental degradation and discrimination against women by 2015"(UN Millennium Project, 2005). Now all of the 191 member states of the UN have given their support for the eight goals which include "(a)chiev(ing) universal primary education" (UN, n.d.). During WSSD, aside from restating the importance of the MDGs' educational objectives, the UN DESD was proposed to indicate that "education and learning lie at the heart of approaches to sustainable development" (UNESCO, 2005).

The UN DESD objectives are to:

"1. Give an enhanced profile to the central role of education and learning in the common pursuit of sustainable development;

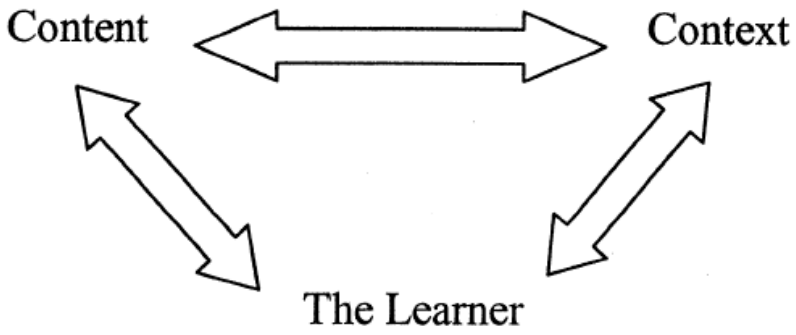
2. Facilitate links and networking, exchange and interaction among stakeholders in ESD;

3. Provide a space and opportunity for refining and promoting the vision of, and transition to sustainable development – through all forms of learning and public awareness;

4. Foster increased quality of teaching and learning in education for sustainable development;

5. Develop strategies at every level to strengthen capacity in ESD." (UNESCO, 2005)

Appendix II The "Learning Triangle"



Source: Adams, 2004, pg. 259

Appendix III Chronos Participant Three Stage Questionnaire

**** Note :**

→There are three rounds of questions. Pre-questions which were meant to be answered before taking the course, the 1st round of post questions to be taken immediately after finishing the course, and the 2nd round of post-questions, designed to be taken 5-7 days following the course

→Most questions in all three rounds refer to people working for a company or organization. If you do not currently work for such a company attempt to answer in regards to your last company/organization working experience (noting that this was a past experience).

Pre-Questions (to be taken before taken the course)

1. Age : ___

2. Gender: Male ___ Female ___

3. Educational Background (ie. science, business, etc.) _____

4. Nationality: _____

5. Current corporate position: _____

6. If applicable, your company's/organization's sector: _____

For the following questions if you work in a company/organization please state your answers in reference to your company. If you are not part of a company, if possible, respond in reference to your last company experience.
For the following three questions, please type one to two paragraphs for each and fit all of your answers on one page.

****There is no one way to answer any of these questions, and as such, no wrong answers.**

7. Please explain how you expect the state of the economy to impact your company/organization in the coming year?

8. If an example exists, write about what you have done at your company/organization to improve the natural environment?

9. Please write about one or two core social values that underpin your company's/organization's choices?

1st Round Post-Questions (intended to be taken immediately after course completion)

****There is no one way to answer any of these questions, and as such, no wrong answers.**
****Please type 1-2 paragraphs for each 10 (a) and 10 (b) and type between a half to one full page for each answer.**

10. You have now taken the e-learning Chronos course:

a) I am interested to understand what you have learned from the course. Would you please explain what the course was about?

b) Please explain the three features of the course which helped you learn the most (including, but not limited to, the text, video, multiple choice, messages, arguments, etc.). How were these features that helped you learn superior to the others? What were the least helpful features? What features were lacking or could be improved to support your learning?

2dn Round Questions (intended to be taken 5-7 days after course completion)

****There is no one way to answer any of these questions, and as such, no wrong answers.**

****Please type approximately a half a page and no more than one page for each of the following questions and type 1 paragraph for each 'i' and 'ii' in the following questions (simply type 1-2 paragraphs for question 14 and 15).**

11. Several days ago, you took the Chronos course. Now that you have had time to reflect, please explain how the Chronos content relates to your:

(i) corporate/organization life both before taking the course and now afterwards?

(ii) personal life both before taking the course and now afterwards?

(i) Corporate/Organization Life:

(ii) Personal Life:

12. Should examples exist, please explain what happened if you have ever tried to make improvements in your:

(i) company's/organization's impact on the natural environment.

(ii) personal impact on the natural environment.

Please explain how what you learned in Chronos may impact your future efforts to reduce the environmental impacts at your company/organization and in your personal life.

(i) Corporate/Organization Life:

(ii) Personal Life:

13. Should examples exist, please explain what happened if you have ever tried to integrate social, environmental and economic aspects at the same time in your:

(i) company/organization life.

(ii) personal life.

Please explain how what you have learned in Chronos may impact your future efforts to integrate these three factors of sustainability into your company/organization life and in your personal life?

(i) Corporate/Organization Life:

(ii) Personal Life:

14. How would you expect your colleagues and management to react to the Chronos program and its content in the context of your company/organization? Please explain the reasons behind this expected response.

15. What were the best and worst parts of the course? If you could change one thing about the course, what would it be? Why would you change it?

Appendix IV Hills Social Impacts and E-learning

(iii) Identifying with the community

There is evidence showing that people will copy others they do not know personally with the intention of feeling part of something 'bigger.' People can take all kinds of steps such as using particular vocabulary and wearing particular clothing. Interest in belonging is a "powerful human motivator". (Hills, 2003, pg. 47) If possible, and this will depend on the target group, knowledge of the target group, and other factors, the engineering of a sense of belonging could have a very positive impact on the e-learning experience. For example, incorporating a well-known and respected individual into the program, if feasible, could attract participation[44] and help to lead to a circumstance where this sense of belonging exists. Hills outlines a range of options including, discussion boards and collaborative learning spaces, to help build a sense of belonging and to help make the experience more like a 'traditional' classroom Hills, 2003, pg. 56). He is correct in his suggestions. Certainly, any kind of online communication, synchronous or asynchronous in nature, including chatting, text messaging, or video conferencing can help.

(iv) Praise

This factor is tied to feedback and can also vary, being dependent upon culture. Regardless, praise "should always" have a place in the learning process, providing the learner with "positive" feelings. It will also matter who or what is offering the praise. (Hills, 2003, pg. 50) An adult may or may not respond well or appreciate praise coming from a cartoon image built into a program in comparison to a child, however, this is a simple hypothesis. What is known is that individuals can be found to require varying types and amounts of praise, and if possible, an e-learning program should attempt to accommodate for these differences (Hills, 2003, pg. 51). Knowing the target group well, extensive trialling, and re-assessment of the course will hopefully allow for this type of personalization.

(v) Humans as information sources

Humans do have an advantage over computers in their ability to both respond to questions and problem-solve through collaboration (Hills, 2003, pg. 52). Certainly, human supports can be provided, allowance for human collaboration can be designed into a program, and attempts can be made to design in answers to questions, but of course the success of this will be limited, especially when there is strict reliance on the computer without external human involvement.

(vi) Computer-Learner Interaction

While computers are far from being 'alive' people can respond to them in a manner likened to an individual responding to another who patronizes or bores them. It may sound silly, but it is not impossible for the learner to take what a computer 'says' personally. (Hills, 2003, pg. 54) Instances have been recorded of 'sane' people speaking to their computer due to upset or anger. Again, the computer will not be capable of reserving the flexible response necessary that a human could possess in dealing with varying personalities and emotional states. (Hills, 2003, pg. 54) Do note that it is human individuals who program computers to eventual 'say' what it is they are to communicate to learners. As such, the utmost sensitivity and understanding of the target group must be kept in mind at all times during the development and programming phase. Next, while the result of this is uncertain, ensuring that the learner knows the expectations placed upon them and how to use the computer and program, and that there are no additional problems (such as program failure or connection difficulties) is essential. This may not stop a learner from getting upset and yelling at the

[44] This example has been given to build a sense of community, but the inclusion of such an individual could simply attract more learners, which can be a goal in itself. As such, this suggestion which could make engaging with the program more attractive could potentially 'kill two birds with one stone.'

computer which cannot apologize, however, it is thought that the better an individual knows what to expect and how to engage, the less likely it will be that they become upset, if at all.

(vii) 'Discussion and Debate

Hills recognizes that discussion and debate can lead to thought organization and reflection, but fails to discuss this point further (2003, pg. 56). The discussion concerning feeling connected to a community is very relevant in this context.

Appendix V Sims' Proactive Assessment – Continued

Table 2-4 - Continued – Sims' framework for proactive e-learning assessment

Sims' Suggested Components for Evaluation	Comments
A developer should be "able to clearly identify why the particular educational program has been developed and delivered on-line."	**This is a fairly logical first step. What are the goals of the program? Do they have a particular connection to the online or 'e' medium in which they are delivered. Will the program be delivered in a standalone fashion? Will the course be involved with some form of 'blended learning' where other media such as classroom learning or in-person group discussions will play a role?**
A developer should "look closely at the content of the course (from beginning to end and ensure the course as a whole is)…a cohesive and easily understood package…The content of the course material must be accurate and all authors should acknowledge any bias they bring to the discussion...The content should also be evaluated based on the ease with which it can be altered and amended…"	**This type of content comparison to which they refer is highly dependent upon the context of the course providers and takers. If the providers are a company, then the material will need to fit with overall company goals and may need to be tailored to suit targeted employees. If the providers are putting their course out to the general public, then they will find themselves potentially coordinating the course with many other groups, courses, and contents, not to mention potential specialization, dependent upon the target group(s).** **The developers must clearly state at the beginning of the course and potentially at other stages of the course what their position, bias and intention surrounding the content of the course are and what their visions are for wider implications. The developer must consider going beyond the limited scope of recognizing bias, as it has been seen in practical examples through the course of this research where communication of these factors has presented a major stumbling block to a course's success. Finally, one of the advantages of e-learning is meant to be flexibility. As such, not only the content, as recommended, but the entire course, methods of delivery, and techniques used within it, must be designed in a manner that changes should be able to be made in the future as easily and inexpensively as possible. Obviously, there will be limits to this.**
The developer should execute an "examination of the interface design. An effective interface is easily mastered by participants and allows for presentation of content in a variety of formats including graphics, video, (etc.)...The design should also be based on a metaphor (such as a campus, building, desktop, filing system) that will help learners navigate among components of the course. The interface should also be customizable by both the students and the teacher to increase their comfort and the readability of the course."	**As the interface provides the 'window' into the course it obviously plays a major role. Sims is perhaps too quick to define an 'effective interface.' Clearly a variety of formats, by their nature or in how they are combined can provide an effective interface. However, due to logistics, finance, etc., some or many of these formats may not be an option. It must be judged whether or not an effective interface can be created under these more limited conditions before concluding that they will be ineffective.**
Developers should assess "the quality, quantity and thoroughness of the assessment of student learning…(A)ssessment drives much learning behaviour and in many ways defines the course – at least as perceived by student participants. Most quality courses have multiple forms of assessment, including assessment of both individual and group work."	**There are many approaches to facilitating assessment. Some of which are more similar to traditional classroom methods whether in real time or asynchronous delivery such as question and answer, multiple-choice testing, peer review, or other forms of examination. Other approaches include the comparison of results and ideas of the learner with others whether they be peers or experts in the field. The learner's results can be placed on a continuum or be graphed against various factors, providing meaningful results without**

Sims' Suggested Components for Evaluation	Comments
	declaring answers which are 'right' or 'wrong.' It is up to the developer and through potential interaction with target students to determine what form(s) of assessment are most appropriate for the type of course they are developing and the type of student evaluation they wish to see.
The developer should assess the "degree of student support…These (support) resources need to focus on the content…on technical issues…and on personal issues."	**E-learning can lead to a "sense of aloneness" for the learner (Garrison et al., 2003, pg. 79), not to mention the fact that a wide range of typical learning challenges and those which can be partial to the medium can arise. Consequently these forms of support are essential. Simply adding another human who provides support to the mix does not automatically solve all of these challenges, however, this can make a major positive contribution in this sense whether the support person is available online or by phone. From a financial perspective, providing effective computer-based support can be preferable and can also avoid various hassles, such as ensuring a human support is available at the right time or has the skills necessary to help the learner. Money aside, the point is to make the courses as learner-controlled and centred as possible. Hills goes so far as to call this requirement, which he says has become clear through experience, concerning learner-control, an "essential truth" (Hills, 2003, pg. 72/73). As such, thorough computer-based support should be provided at an absolute minimum. The three areas, content, technical and personal issues are all important and must fit together like a puzzle if the learning experience is to function well.**

Materials in this table were derived from Sims, 2001, as cited in Garrison et al., 2003, pg. 102-104

Appendix VI Laurillard's Four Part Teaching Strategy

Here we will apply Laurillard's four part teaching strategy to e-learning in general.

Strategy	*Implication for E-Learning*
Discursive:	
i) The teacher's and student's conceptions should be continually accessible to the one another;	**Depending on how an e-learning program is constructed, the level of built-in flexibility and how it is administered, it could be difficult for an e-learning program to deliver on this component of the teaching strategy. For such continual accessibility to be made possible a program must include defined times when student and teacher can interact in person, by phone, online, etc. Otherwise there must be some type of messaging system where student and teacher can send and receive messages at different times to attempt to effectively meet the discursive strategy. The fact that such coordination is required as opposed to a classroom teaching model where student and teacher are able to communicate in person on a regular basis, the education provider faces increased the levels of difficulty which can detract from the program.**
ii) The teacher and student must agree upon the learning goals for the topic[45];	**Unless program designer/teacher and student agree on such learning goals previous to program creation or continued communication during the program coupled with program flexibility, meeting this component will be difficult if not impossible.**
iii) The teacher must provide an open discussion-based environment for the topic goals, within which students can generate and receive feedback on descriptions appropriate to the topic goals.	**Reasons already explained can complicate the creation of an effective discussion environment and impede the generation and distribution of effective feedback. The generation, sending and receiving of feedback in an e-learning program can either benefit from or be challenged by the implicit 'protection' or 'barrier', depending on the perspective, created through the program. For example, in a traditional classroom some participants may feel inhibited from communicating for various reasons. As the e-learning program structure can provide some 'protection' or an anonymous feeling, the same individual may feel more comfortable under these circumstances communicating with the class or teacher. Of course, this same structural difference could backfire, causing misunderstanding or a lack of social cues, leading to less communication. Again, if the program of concern is self-contained, students may not be able to submit their feedback and may only be able to receive pre-defined feedback created originally by the course designer as a best case scenario. Such pre-defined feedback would not be available through a discussion environment.**
Adaptive:	
i) The teacher has the responsibility to use the relationship between her/his own and the student's conceptions to determine the task focus of the continuing dialogue;	**Reasons already explained can complicate such a process and continuing dialogue. Obviously, the teacher will require suitable access to the student and the student's conceptions for such reflection, something which could be difficult or impossible in an e-learning program. Again, through pre-designed recognition and feedback, this can be made possible to a degree if there is no teacher.**

[45] There is some lack of clarity regarding this point whether she means that both teacher and student actively engage to create and agree upon learning goals or if the teacher simply provides these goals and the student willingly agrees to them. Here it is assumed the former option is correct.

ii) The student has the responsibility to use the feedback from their work on the task and relate it to the conception.	**The sending and receiving of effective feedback can be challenged or impossible. This must be accomplished if the student is to be enabled to use such feedback. However, even a standalone program can provide pre-defined semi-tailored feedback. In an activity involving closed responses, analysis of these responses can be given, and in the case of using open responses certainly keys to remember or potential model answers can be provided after the fact which may indicate something is 'right' or 'wrong' or simply help to drive the learner's reflection further.**
Interactive:	
i) The teacher must provide a task environment within which students can act on, generate and receive feedback on actions appropriate to the task goal;	**For reasons already stated, the creation and provision of feedback can be quite difficult or impossible. If such feedback is made possible, the program must be designed with such flexibility that a student is able to act on the task goal while taking such feedback into account.**
ii) The student must act to achieve the task goal;	**With proper design it is believed that a student should have the opportunity to act to achieve the task goal. Of course, the challenge is to balance closed and open types of answers which regulate the level of freedom the student and the resulting challenges in potentially analyzing the answers and letting the student know whether or not they have been successful.**
iii) The teacher must provide meaningful intrinsic feedback[46] on their actions that relates to the nature of the task goal.	**While such intrinsic feedback must be designed into a program it is believed that this provision is possible, and depending on the creativity and ability of the designer can be done in a very effective manner facilitating successful learning.**
Reflective:	
i) The teacher must support the process in which students link the feedback on their actions to the topic goal for every level of description within the topic structure	**Feedback can present a serious problem for the teacher and for these same reasons it can also be problematic for the teacher to provide effective support in such a process, especially in a standalone format.**
ii) The student must reflect on the task goal, their action on it, and the feedback they received, and link this to their description of their conception of the topic goal.	**It is reasonable to expect that a student will be able to reflect on the task goal and their action on the goal, however, as effective feedback could be questionable, it could be difficult for a student to link these three aspects to their conception of the topic goal.**

Laurillard, 2002, pg. 77

[46] Laurillard defines intrinsic feedback as "that which is given as a natural consequence of the action; the feedback is intrinsic to the action" (Laurillard, 2002, pg. 55).

Appendix VII Key Mathemagenic Activities[47]

Key Mathemagenic Activities: Student and Teacher Roles

Aspects of the Learning Process	Student's Role	Teacher's Role
i) Apprehending structure of the discourse **– eg. focus on the narrative line, distinguish evidence and argument, organize and structure the content into a coherent whole.**	**Look for structure. Discern topic goal. Relate goal to structure of discourse.**	**Explain phenomena. Clarify structure. Negotiate topic goal. Ask about internal relations.**
ii) Interpreting forms of representation[48] **– eg. practice mapping between the concept, system, event or situation and its representation, practice using the forms of representation of an idea, represent the discourse as a whole as well as its constituent parts.**	**Model events/systems in terms of forms of representation. Interpret forms of representation as events/systems.**	**Set mapping tasks between forms of representation and events/systems. Relate form of representation to student's view.**
iii) Acting on descriptions of the world **– eg. combine descriptions and representations to generate further descriptions of the world, manipulate the various forms of representation of the world.**	**Derive implications, solve problems, and test hypotheses, to produce descriptions.**	**Elicit descriptions. Compare descriptions. Highlight inconsistencies.**
iv) Using feedback **– eg. use both intrinsic and extrinsic feedback**[49] **to adjust action to fit the task goal, and adjust descriptions to fit the topic goal.**	**Link teacher's re-description to relation between action and goal, to produce new action on description.**	**Provide re-description. Elicit new description. Support linking process.**
v) Reflecting on goal-action-feedback cycle **– eg. relate the feedback to the goal or message of the discourse, reflect on how the link between action and feedback relates to the structure of the whole.**	**Engage with goal. Relate to actions and feedback.**	**Prompt reflection. Support reflection on goal-action-feedback cycle.**

Laurillard, 2005, pg. 60, 72

[47] This table is adapted from Laurillard's book Rethinking University Teaching by combining a table on the roles of student and teacher in the learning process and an outline of the activities students must address to create learning success.

[48] Laurillard states that "academic study cannot do without special forms of representation – language, mathematics, diagrams, symbols – but how do students make sense of them? No subject area escapes this problem because they all use at least language to represent ideas " (Laurillard, 2002, Pg. 48).

[49] Laurillard defines extrinsic feedback as that "which does not occur within the situation but as an external comment on it: right or wrong, approval or disapproval. It is not a necessary consequence of the action, and therefore is not expressed in the world of the action itself" (Laurillard, 2005, pg. 56).

Appendix VIII Mathemagenic Activities and General E-Learning

According to Laurillard there are five key mathemagenic activities that students must address if they are to succeed in learning (Laurillard, 2002, pg. 60-61). These key mathemagenic activities could have the following significance for e-learning programs[50]:

i) Apprehending the structure of the discourse
This aspect can be achieved in developing an e-learning course. As with many of the 'key' activities, along with the teaching strategies discussed earlier, the tools and understanding that a student brings, are in large part, influenced by experience, and those tools provided in the e-learning course itself will play a major role in determining the success of the student and teacher in achieving their roles, linked to this category. For example, a student's culture and academic history can dramatically alter their perception and understanding of new experiences, thus influencing what it is the student apprehends and how they go about this process.

ii) Interpreting forms of representation
As stated in the previous paragraph, the tools and understanding a student bring, such as culture and academic history, will also impact their interpretation of representation.

iii) Acting on descriptions of the world
The tools and understanding a student bring that have been discussed, in the previous two paragraphs, are also applicable here. At least mentally, if the student understands the material, they should be able to combine descriptions and representations to generate further descriptions of the world. Depending on how the program is developed or how the student works outside the program, s/he may be able to manipulate the various forms of representation of the world. Again, depending on program design, hypothesis testing on the part of the student may be possible within the program, and yet, it could be very challenging to design the course to support such testing.

iv) Using feedback
Intrinsic and extrinsic feedback were discussed in section 2.1. Intrinsic feedback occurs as a "natural consequence" of an action. Extrinsic feedback does not occur organically as a result of an action but is an "external comment" on the action. An example would be a teacher or program stating that an answer is 'right' or 'wrong', however these particular forms of feedback can be ineffective should they lack further explanation as to why they were given (Laurillard, 2002, pg. 56). This type of feedback could be programmed into an e-learning course. Student-teacher interaction is going to provide much greater latitude in the provision of flexible and effective feedback in comparison to that which is pre-programmed into a course. Dependant upon the complexity and the boundaries of the program, the ability of the programmer to 'design in' appropriate forms of feedback can be challenged. The Chronos course demonstrates how relatively effective feedback can be included in a 'standalone' course. If feedback or at least appropriate feedback cannot be provided through the course then either student or teacher will find fulfilling the roles of this category impossible.

[50] If using these criteria for course evaluations the 'ideal' scenario would be to use them to gather a course designer's perspective which can then be compared to individual students' experiences. It is believed that such a process can yield important qualitative results that can assist in the improvement of such an e-learning course or in improving the design of all other e-learning courses.

v) Reflecting on goal-action-feedback cycle
The issue of feedback has already been discussed. Should feedback be adequately provided, the program will still need to facilitate the connection of that feedback with the learning goals, and hopefully have an opportunity to take additional action in light of the potentially new found understanding.

Appendix IX Chronos Developer's Discussion - Continued

Diversity - Continued

Once again, dealing with the diversity issue was particularly difficult in section five of the Chronos course which is designed to focus on implementation. In many ways, if this is to be done properly, a course designer must have company-specific data. One thing that could have helped them to solve this problem would have been for them to have included additional business case studies. However, this could lead to a 'catch 22'. While adding such case studies could provide more concrete and individualized material, the developers could then encounter the problem of adding too much material which could degrade the course experience. If there is enough learner control, allowing the learner to prioritize the case studies important to them, and to ignore all others, the potential problem regarding too much content goes away. In light of the challenge with this section, they primarily focussed on designing it to motivate learners to find materials and tools which will help them move 'sustainability,' ahead. The course developers found that when companies customize the course, something the developers recommend, it is section five that the companies typically put a great deal of emphasis upon. For example, Shell has inserted videos into this section to discuss how they are working on these issues and have included links to their SD tools.

Users - Continued

While the WBCSD has many members that are in OECD countries, the organization receives lesser interest from companies based in less-developed countries. As such this influences how the program is shaped. For example, Brazilian companies responded poorly, and yet, this was expected beforehand. The hope was that customization would be able to "take care of this" dissatisfaction.

Engagement - Continued

Further, the telecom company, as a whole, almost failed to deliver their results at all. After their initial statement that they could be finished in less than the maximum provided time, after passing their final date of expected completion, and after the CFO, who led the group, requested that all participants complete the work, only one person out of the entire group of seven employees actually complied!

Employee Satisfaction and Quality

The course developers recognized and noted studies which show that a company's social and environmental record can play an important role in employee's decision of whom to work for (von Rimscha, 2005, pg. 32). This was directly reinforced during the assessment of the learning experience garnered by one of the Chronos participants in this thesis research. The individual is a relatively new addition to the workforce; s/he, completely independently, made it very clear that while s/he had not given his/her choice of employer great thought besides the money s/he would earn; after having taken Chronos, s/he emphasized that s/he would be far more vigilant in choosing to stay with or work for a more responsible company.

Evaluation - Continued

While it is not so much a failure but a crucial step that is about to occur, the developers have yet to perform a formal evaluation of the course. What has been done is to accumulate a significant amount of detail during the Beta testing which lasted for three months. During Beta testing process, every 'piece' of the course was independently reviewed, and one section entitled 'You're In Charge", for example, was re-written 50 times. While it is not entirely clear if the following comment was strictly related to this revised section or to others in the course, the developer wanted to be sure that they did not create a "greenwashing tool." Unfortunately, although the Beta testing is completed the resulting information has yet to be written up into formal summaries and further results were not available.

Computer-Based Issues
The course is missing some of the games or animations that other programs have. However, this resulted in a program that is smaller in size, which can be used more widely.

Unfortunately, Chronos is not compatible with Macintosh computers further limiting the people who can utilize it.

Sales
There are "many" companies which are near the buying stage, however they typically purchase between 1 to 100 Chronos licenses and take a long time to test and customize before making significant purchases.

Other Strengths
The course is very simple to use requiring learners to engage in very basic tasks (i.e. straightforward reading, simple navigation, and clicking on easy to recognize buttons). Only someone who has not used a computer would have problems with navigation. Furthermore, the developers have stated that there are six standard corporate management systems worldwide and Chronos is compatible with all of these.

Customization
The developers have found that requests for customization are divided into two groups. The first are those that wish to incorporate their branding, including changes such as logo inclusion, welcome message, and/or a section on the company's principles. The second group wish to assess and revise the content to tie it more closely with the manner in which their company functions in terms of language, diagrams, etc. (von Rimscha, 8 August 2005, B).

Expectations: Generic Standalone Users - Continued
The course will:

- provide these learners with the first layer of learning on SD, including; an introduction to the topic, a general sense of what it is about;
- foster enthusiasm for SD;
- generate some good conversations;
- provoke reflection over the content;
- stick ideas in the learner's minds;
- help learners understand their roles and positions in the global society;
- provide some sense of the fast moving world we live in;
- demonstrate uncertainty about the future;
- show how SD is a complex topic;
- highlight a range of dilemmas that need to be grappled with;
- show SD is not easy to achieve;

- demonstrate how business plays a critical role;
- show individuals and companies that they are part of the SD solution but are not alone;
- show how "lots" is already happening surrounding SD in companies and the world but that this is still not enough;
- show links between these ideas and their sector and business;
- provide possible actions which could be taken;
- help learners see what may be missing in and outside of their companies to help create sustainable world.

Appendix X Focus Groups Discussion - Continued

Reflection on Chronos (continued)
This discussion was kept brief and the typical statements were raised (i.e. the course seems more geared to bigger businesses, potentially in the industrial sector; more examples closely tied to their own business would have been appreciated, etc.) which could likely be remedied with customization. There was agreement that the course, in its generic form, had lessons and stories which could be connected to any company. One employee felt that the course was more directed at the individual than at the company, as a whole, and as a result, this helped him/her to make a connection and brought greater value to him/her.

Transportation possibilities
When first asked to discuss what action could be taken by the company the group seemingly randomly jumped on the topic of transportation and stayed on this topic. Various ideas came out including instituting car pooling, providing the sales people who travel significantly with hybrid cars, running an in-house system modelled on the Auto Share concept, by which the company would have a small fleet of cars (hopefully, 'greener') which could then be signed out by employees when and as needed. The car pooling, for example, was seen to be problematic unless passengers were to make their way to the driver's home and the driver was compensated, in some way. Purchasing cars would represent a significant expense, and regardless of what system was implemented, if the cars were bought by the company they would need to buy 'multiple', and they would be required by those without cars and those who live close to the office/car location.

Some talked about purchasing company bikes for getting to business meetings and also to provide additional platforms for advertising. Unfortunately, bad weather, some employees' lack of fitness, the unprofessional appearance that may be perceived and only being able to reach meetings which are close by were all challenges in this case. Still, one participant said that after taking the course they had begun to ride their bike on a regular basis and "feel better" as a result.

Finally, the group talked about providing financial incentives for using public transit and for money to be put towards the purchase of 'green' vehicles. Interestingly, one manager said that while they already pay a car allowance to particular employees, they have already turned away "good" people they wished to hire for the simple reason that the prospects did not own their own vehicle. Related to transportation, the participants began to discuss how many maps are printed for sales calls which lead to increased paper use. One participant raised the prospect of purchasing global positioning system (GPS) devices for the sales staff. They thought the devices were "cheap", approximately $100 Canadian ($83 USD), would save the paper used for printing maps and would help the users find the 'best' routes, in turn, saving gasoline and time.

Computer possibilities
One other non-core business strategy idea regarding computers was raised. It was thought that if the company either purchase laptops when replacing or adding to the personal computers in the office or gave the employees a set amount of money to purchase their own laptop this could lead to multiple positive benefits. First, the laptops would be far more resource efficient than the computers currently found in the office. Next, many if not most employees are purchasing their own computers/laptops independently in addition to what they are using in the office as it is. As such, this could lead to the purchase of one, not two computers/laptops per person. The laptops would likely use less energy. Furthermore, the people would have greater flexibility in working from home which would reduce commuting energy use and wasted time. Finally, it was thought that the teams which make presentations outside of the company could take laptops which would provide for more professional

presentations which would not require the same degree of hard materials, thus leading to reduced material intensity.

Action resulting from the course and focus group
Regarding the "initiatives coming out of the…meeting, there's lots of action.

1. We're doing the research to move ahead with the bike project - making 2 or 3 bicycles available to staff to use for meetings within a short distance of the office. I have someone who will come in to discuss bike safety and we're just checking into the fine details around the rest of this project.

2. As well, we discussed getting laptops for reps to replace their old box computers. Our head computer guy thought this was a great idea - will save paper and energy, be within the same price range, will make the reps' job easier, etc. So this looks like a go.

3. We're experimenting with turning lights off in the office that are not required (although there is some issue of the landlord not wanting us messing with the fuse box).

4. I'm getting more info on possibly participating in WindShare (wind energy options).

5. We're now involved in or looking into (count 'em) 3 different Energy Efficiency initiatives (Zero Footprint, 20/20 and the Ontario Power Authority).

6. …(Offering)…lunch-time seminars - another initiative stemming from meeting 1, which has been approved.

7. The formation of an environment committee was okayed - to include reps from each department - no action on this yet.

8. And the company is purchasing copies of The Ecology of Commerce for all course participants" (Source: Internet-company contact).

Clearly, a tremendous amount of action has resulted from this process.