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A PROCESS MODEL OF LEARNER BEHAVIOR AND ENGAGEMENT DURING WEB-BASED TRAINING

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J Kevin Ford
Major professor

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By

Ann Williams Howell

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ABSTRACT

A PROCESS MODEL OF LEARNER BEHAVIOR AND ENGAGEMENT DURING WEB-BASED TRAINING:

By

Ann Williams Howell

Web-based training (WBT) is a new training medium that offers many advantages to organizations. However, it is important to understand how WBT influences the individual learning process and training outcomes. In this study, a research model was designed and tested that measured behavioral choices (content choice and activity level) and engagement choices (attentional focus and emotional engagement) made by learners during a WBT course. Learner control was manipulated in the experiment (high control and limited control) and was expected to interact with individual differences such as mastery orientation, Web self-efficacy, attitude toward WBT, and microcomputer playfulness to influence the learner's choices. The process choices were expected to influence learning outcomes, including declarative knowledge, skill-based learning, application self-efficacy and satisfaction with training. The model was built on a motivational foundation that pulled elements from cognitive choice theories and theories of intrinsic motivation.

In the study, 236 participants took a self-paced, WBT course on Change Management in a laboratory session, and measures of individual differences, process variables and outcomes were collected. Few of the hypothesized relationships were significant, so the results did not provide strong support for the model. The learner control manipulation did not have an influence on the learning process and outcomes,

leading to the thought that learner control research might need to be approached from a different perspective. The results did show some support for the relationships between the process variables and the outcomes, supporting the idea of using process models to study training. For example, emotional engagement related to satisfaction and to application self-efficacy, and satisfaction was also related to attentional focus. One conclusion of this study was that engagement is an important variable in WBT, and it may provide an alternative (and more effective) method for studying learner control. Content choice was related to declarative knowledge, and activity level had a marginal relationship with skill-based learning. In addition to the outcome relationships, the study also found relationships between mastery orientation and content choice, as well as between attitude toward WBT and emotional engagement. A post hoc model found some support for satisfaction as a mediator between the process variables and the outcomes variables. This study concludes with a discussion of the results, limitations and directions for future research.

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much I learned in graduate school. The content I learned is critical for my success, but equally important is the ability to think in a scientific and investigative manner. I am starting to recognize and enjoy the benefits of my education. Second, I would like to thank all of the fellow students, friends, and family who supported me during this time. I received invaluable help, support and encouragement from Wendy Golden, Ken Brown, Lori Sheppard, Dan Weissbein, Sandy Fisher, Mike Wasserman and many others. My parents also provided constant counseling and support and encouragement during my entire graduate career. Most importantly I want to thank my husband, Tim. He gets thanks and credit for supporting, helping and standing by me during this process – even the bad days. I sincerely believe that spouses deserve an honorary Ph.D. for the sacrifices and demands that a dissertation places on the entire family.

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INTRODUCTION

Web-based training (WBT) is the performance improvement buzzword of the moment. The use of WBT is quickly gaining interest in corporate and university settings, but organizations should not blindly jump on the WBT bandwagon (Craiger & Weiss, 1997). The lure of the technology should not distract organizations, educators and researchers from the fact that training in any medium is only worthwhile if it results in desired learning outcomes. Very little empirical research has been done to examine the learning process or outcomes of WBT, so its value has not been scientifically proven. One reason for the lack of research is the relative newness of the technology.

Common use of the Internet only started in the mid-1990s, but usage has exploded. Use of the Web is becoming a necessary skill for business and life. The widespread acceptance and growing use of the Web means that it could be a potentially good tool for distance learning. Distance learning allows people to take university and work-related courses and training from their homes and workstations regardless of where the training originates.

Training on the Web presents many opportunities and challenges for practitioners and researchers. From one perspective, WBT is simply another training medium – essentially it is the next generation of computer-based training. This viewpoint should help remind training designers that WBT still needs to fulfill all of the traditional requirements for robust training such as incorporating sound instructional design and meeting criteria for effectiveness and transfer. From another perspective, WBT offers exciting opportunities for designing new types of training (e.g. simulations), fulfilling

organizational needs (e.g. educating a distributed workforce) and new methods for collecting research data (e.g. monitoring behavior during training). The obligation to maintain high instructional design standards needs to be considered along with the opportunity to embrace innovative technology. The technology is constantly changing and improving.

WBT is training that is taken using a computer that is accessing a program on the Internet or on a corporate intranet. It functions similarly to computer-based training (CBT), but there are some important differences. CBT programs usually run from a diskette or a computer hard drive, whereas WBT runs from a separate computer server. The trainee's computer uses an Internet connection to exchange information with the server that hosts the training. Server technology and the Internet allow multiple users to access the same course, permit administrators to make changes in a central location, and collect individual performance data in a central database. Another difference is that WBT is accessed using a Web browser such as Netscape or Internet Explorer. The Web browser provides the window to the training. The course can be hosted either on the Internet (public domain but usually requires password access) or a corporate intranet (closed corporate network). WBT uses hyperlinks to offer a non-linear training experience which can incorporate interactive exercises, graphics, sound, video, testing, feedback, practice, personalization and more. WBT experiences can be simultaneous (all class members logged on at the same time with instructor guidance) or asynchronous (students work alone in a self-paced environment).

Although the instructional value has not been fully, empirically tested, there seem to be many practical benefits to WBT for individuals and organizations. One benefit is

that WBT offers learners considerable flexibility. They can proceed at their own pace, receive individualized feedback and access needed performance support tools. Furthermore, self-paced WBT is available 24 hours a day, seven days a week. This allows employees to take courses from home and also provides more training opportunities to off-shift workers. Well-designed WBT should be easy to use for anyone who is familiar with surfing the Web. Graphically-rich, user-friendly Web interfaces allow the learner to navigate by pointing and clicking the mouse, and the course can offer additional help and learning support (Stevens, 1996).

WBT courses can benefit organizations by being easy to maintain and update, offering tracking and reporting capabilities and making just-in-time training accessible to all employees. The course material is easy to update, because it can be done with one change made on the server. This means that small changes can be made to the content (such as fixing errors or adding material) without requiring a huge effort such as pressing new CD-ROM disks or copying and distributing new binders (Filipczak, 1996). Since all information comes from one central server, the organization knows that employees are accessing the most current information. The Web also offers sophisticated tracking features that can record individual training performance (Filipczak, 1996), share scores and completion information with a training administration system, and provide input into group and organizational level competency reports. The Web also allows global distribution of the training from the same server allowing the system to monitor employees as if they were all in the same room (Stevens, 1996).

Although anecdotal evidence indicates that learners and organizations benefit from WBT, it should not be embraced without serious thought (Craiger & Weiss, 1997).

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WBT creates many opportunities and challenges which should be researched in an systematic fashion. Due to the newness of the technology, very little rigorous empirical or conceptual research exists on WBT. Most of the literature on WBT focuses on design issues or case studies (e.g. Khan, 1997), whereas the focus should be on the learning process and outcomes. WBT provides a unique context for studying the learning process. It allows the learner to control different aspects of the learning and also allows the researcher to collect robust data, including the actual decisions made (path taken).

Description of this study. Although there is limited research on WBT, many related research areas (learner control, CBT, traditional training) provided a foundation for exploring this new medium. From a research perspective, it was important to understand the psychological underpinnings of the learning process during WBT. Therefore, the focus of this study was on the learning process and outcomes in a self-paced, learner controlled environment. Specifically, the study conceptualized the learning process in terms of choices made by the learner. These choices included behavioral choices (content choice and activity level) and engagement choices (attentional focus and emotional engagement). The model was based on a motivational foundation taken from the theories of cognitive choice and intrinsic motivation. This investigation of the learning process included a framework for studying learner control, a review of the literature, a research model and an empirical study. Although this study discussed ideas that are relevant to other types of training (such as self-paced training in other mediums), the focus was on self-paced, nonlinear, Web-based training designed for adult learners.

Framework for Learner Control. In order to clarify the relationship of several important concepts, Figure 1 presents a framework for learner control environments.

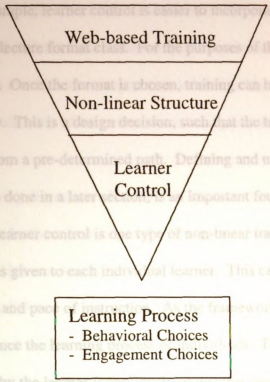

Figure 1. Framework for learner control

The framework indicates that there is a hierarchy or a series of successive design decisions that can influence the learning process. The first decision is whether or not to use WBT as a training medium; the second decision is whether or not to design for non-linear structure; the third decision is how much control to give to the learner. This high-level framework provides the basis for investigating the definition and origins of the concept of learner control. Training design decisions influence the opportunity for learners to make choices about their own learning. Understanding the design issues helps define learner control, which in turn helps understand the learning process of the individual.

As seen in the framework, one of the first design decisions facing an instructional designer is the format or medium for the training. This decision affects all subsequent decisions. For example, learner control is easier to incorporate into a self-paced Web course than into a lecture format class. For the purposes of this study, the Web was the medium of choice. Once the format is chosen, training can be designed to proceed non-linearly or linearly. This is a design decision, such that the training will or will not allow learners to vary from a pre-determined path. Defining and understanding non-linear training design, as done in a later section, is an important foundation for understanding learner control. Learner control is one type of non-linear training in which control over the learning path is given to each individual learner. This can include control over the sequence, content and pace of instruction. As the framework indicates, learner control is expected to influence the learning process of individuals. The learning process refers to the choices made by the learner (consciously or unconsciously) during the training. Choices can be made about behavior (such as which pages to read) and level of engagement (such as the amount of mental energy dedicated to the learning task). The framework provided structure for the discussion and literature review of these concepts. In a later section of this study, these concepts were incorporated into a research model along with individual difference variables and training outcomes.

Research direction. In addition to proving a framework for investigating the learning process, this study contributed to the literature by testing a research model for WBT, which has rarely been done (see Brown, 1999 for an exception). This model had theoretical foundations in the motivational research –specifically cognitive choice and intrinsic motivation theories. This study built on the empirical work done by Brown

(1999) but also incorporated several new elements. Specifically, this study provided an experimental manipulation of learner control, introduced the construct of engagement to the learning process in WBT and measured the relationships of some new individual difference variables and outcomes. The study also used a new data collection technique for process models in which the computer recorded all of the actions taken by the learner. This allowed the collection of behavioral data that represented the choices made during the learning process.

The following discussion of non-linear design and learner control was intended to provide a rationale for the research model. The learning process formed the core of the research model, which was tested in the experiment described in the Method section. Several individual differences were identified that were expected to influence the learning process, and were therefore included in the research model. These individual differences included mastery orientation, Web self-efficacy, attitude toward WBT, and microcomputer playfulness. Outcomes of the learning process that were investigated included declarative knowledge, skill-based learning, satisfaction with training, and application self-efficacy. The literature review discusses the concept of non-linear training and learner control as well as introducing other relevant concepts. This review sets the stage for the presentation and justification of the research model, hypotheses and method section of the study.

LITERATURE REVIEW

This literature review introduces and analyzes the critical concepts that are related to learner control and WBT. The literature review discusses non-linear training, learner control, the learning process, and learner choices (behavior and level of engagement). After the literature review, the research model section combines these concepts with individual difference variables and training outcomes to create an empirically testable model.

Non-linear Training

As Web-based training has gained popularity and increased in usage, one commonly promoted benefit is that it provides a "non-linear" learning experience (Khan, 1997). However, defining non-linear training is a challenge. The term non-linear implies lack of organization and structure, both of which are generally considered critical elements of well-designed training. So, is "non-linear training" an oxymoron or can it be a reality? The linear/ non-linear concept is a training design issue, because it deals with the way that information, ideas, exercises and testing are presented to the learner. Specifically, it refers to who or what controls the series of events that occur in a training session.

In linear training, all learners are presented with the same predetermined sequence of information. Linear training is controlled by the course structure, and the instructor or program enforces that pre-determined structure. For example, in order to teach a process, the training usually starts by teaching the first step and ends with the final step. An instructor or computer program would lead all learners through the course in the same

order and have them complete the same exercises, tests and pre-requisites. In the past, most formal training, especially in schools, has been this type of linear experience.

In non-linear training, the course does not require that all learners follow the same path, because it offers a variety of ways to proceed through the material and learn the same information. In linear training, control comes from the pre-determined, unalterable structure and sequence of the training. In non-linear training, the structure and sequence are not pre-determined, so control is given to an external source (external to the course structure). The external source of control could be an instructor, adaptive computer program or the learner. In this paper, non-linear training was defined as follows.

> *Non-linear training offers opportunities to vary from a pre-determined course structure and progression. Training content can be accessed or presented in different ways as controlled by an influence, which is external to the actual course structure.*

This definition of non-linear training has five critical elements for self-paced, Web-based training. The first element is that the linear/ non-linear contrast is an instructional and technical design issue. Either the course is designed to control learning progression (linear), or the course is designed to give control to an external source (non-linear). The second element of non-linear training is that the external control source referenced in the definition can vary. The most common external source of control would be the learner, and this would be true for most self-paced learning. The learner controls how and what to study in the course (within the course constraints). However, learner control is just one option for control in non-linear training. Non-linear training can also be controlled by the computer, in cases such as adaptive training or targeted

training. In these cases, the computer assesses the learner's needs and sets an individualized path through the material. Similar to computer-adaptive testing, adaptive training can use a computer to monitor the progress of a learner and tailor future exercises and information based on the level of understanding. Targeted training allows the learner to take a pretest covering the learning objectives and receive a feedback report that indicates modules that can be skipped and those that need to be taken. These are not mutually exclusive categories, so some of these control elements can be combined in a training course (i.e. a learner gets a targeted training report and also controls which exercises to complete).

The third element of the definition is that it is not specifically restricted to individual, self-paced learning. Non-linear training could occur in a group setting with the group or an instructor making decisions about what the group should do next. The fourth element is that non-linear courses can vary in the amount of control given to the external source. In an extreme form, the external source might control all aspects of training such as sequence, practice, time spent, number of modules completed and more. However, very few topics could effectively be taught without some structure, whether the structure was obvious (prerequisite modules within the training) or implied (modules for process steps presented in a hierarchical menu format.) Pure non-linear training without any organizing guidance would be ignoring good instructional design principles and likely result in confusion. In a more moderate conceptualization, the external source might only control some of the elements. This allows the course to be organized and structured to ensure a minimum amount of exposure to the material, but still offers the flexibility of non-linear training.

The fifth element of the definition is that the choices provided in non-linear training can range in size and importance. In some training, the choices might be critical ones such as whether or not to take a module. This choice could influence the amount of material provided the learner and could result in critical information being missed. In another non-linear course, the learner may be able to choose the order for proceeding through the modules, but be required to complete all of them. Size of the choices can also vary by the level of the training that is targeted. Some choices would be at the module level, while other choices would be at the exercise or practice level. Additional choices could occur at the level of whether or not to click on a link for extra practice or to view a job aid. One common type of non-linear training is learner controlled, and the learner control research is described in more detail in the following section.

Learner Control

Learner control is one type of non-linear training that occurs when the learner has control over some aspects of the learning event. Learner control is an important element of WBT, since the learner often has a choice about how to proceed. Many different definitions of learner control exist in the current literature, but the definitions focus on different elements and sometimes confuse design issues and behavior. Learner control has been described in terms of the options available to the user. Murphy & Davidson (1991) described three levels of learner control: complete learner control, program control/ adaptive control (the computer controls progression) and learner advisement (computer provides suggestions about next steps). Reeves (1993) states that learner control and program control form a continuum of learner latitude that varies widely among different examples of computer-based training. In this paper, learner control is a

form of non-linear training that gives some control of instructional event to the learner. A course is designed to be linear or non-linear. If a course is non-linear, it can be designed to give control to the learner, resulting in learner control training. Linearity and learner control are design issues that are built into the course by the instructional designer.

Although learners may take the same course with the same design features, the learner control factor allows them to have different experiences. Many theories of psychology such as the aptitude-treatment interaction theory (Snow & Lohman, 1984) indicate that people and training situations interact to create different outcomes. Different learners in the same learner control course are likely to make different choices and have different outcomes. Some learners would explore many of the unrestrained features, and other learners would not deviate from the most obvious or easiest path. The behavior and choices made by a learner when confronted with a learner control, non-linear training environment would be defined as learner choice (Williams, 1996).

Over two decades ago, Steinberg (1977) provided a review of learner control in computer-assisted instruction. She indicated that learners could be given control over variables such as instructional strategy, sequence of instruction, completion time, amount of practice and level of difficulty. The premise was that students would be more motivated, have a better attitudes and pay closer attention to the task if they had some control over their learning. There was not much research at that time, and the early research showed mixed results. For instance, Fisher, Blackwell, Garcia & Greene (1975, cited in Steinberg, 1977) found that learner control improved task engagement but hurt

performance. Steinberg's 1977 review did not support benefits for learner control in computer courses. In a later review, Steinberg (1989) provided some possible explanations for the earlier poor results. It was suspected that the early studies failed because they did not consider the psychological processes in learning or include individual differences variables. Newer lines of research focused on student strategies (information processing and metacognitive skills) and providing support (adaptive advisement) for learner control (Steinberg, 1989).

Control can be provided to the learner through many different methods or combination of methods. Some researchers (Merrill, 1984, Chung & Reigluth, 1992) classify control in terms of content, sequence, pace, display, internal processing, and advisor strategies. Milheim and Martin (1991) focus on three primary learner control elements: pacing (controlling speed of presentation), sequence (controlling order of presentation), and content (controlling material presented during a lesson.) All three of these elements were theorized to increase feelings of perceived personal control over the learning environment. All three were also expected to influence rate of encoding during learning. Sequence and content were expected to influence the development and use of schemas.

Milheim and Martin (1991) provided several reasons for the predicted effectiveness of learner control. From a motivational perspective, learners should respond positively to having control for choosing personally relevant information. A basic assumption of this perspective is that learners want control and want to have an active role in their own learning. Another reason is that attribution theory indicates that learner control may cause learners to attribute success to their own actions, hence

increasing motivation and learning. Finally, an information processing perspective indicates that learners would be able to organize information and learning in a way that is personally relevant, which should increase their attention and retention.

Studying Learner Control. Learner control can be studied using many different methods, and two typical research methods are described in this section. One type of study compares two forms of learner control (full versus lean), and another type of study compares a learner control version of a course with a program control version. In the full versus lean type, learner control of pacing, sequence and content was studied by presenting learners with either a full or lean version of a computer-based training program. Hannafin and Sullivan (1996) studied 91 high school students taking a computer-based geometry course. The lean version of the course contained basic information, and learners had to use an ADD button to get additional information. The full version contained all of the information, and learners could use a SKIP button to pass by unneeded instruction. Results indicated that students in the full course viewed about 50 more of the optional screens than learners in the lean course and scored better on the posttest. This study actually offered learner control to both groups, but each group was required to do an opposite action (add or skip). The results indicate that learner control might be more effective when students are given control to skip potentially unnecessary information, rather than given control to add potentially helpful information.

In the second type of study, the results of students in learner control sessions are compared to the results of students in program control sessions. Kinzie, Sullivan, and Berdel (1988) studied 98 eighth grade science students as they took a solar energy course that was either learner controlled or program controlled. Both courses gave the learner

control over the pace, and all learners answered practice questions and received feedback. In the learner control version, learners had an option of whether or not to review material after an incorrect question. The program control learners were automatically given review if they got an answer incorrect. They found that learners in the learner control condition scored higher on the posttest than those in the program control condition. Even so, they were careful to note that students should only be given limited control, since permissiveness is unacceptable in a learning environment. Permissiveness would describe a situation with no constraints and structure, and it would likely lead to neglect, chaos and anxiety (Ryan, Connel, Deci, 1985). Limited learner control allows students to adjust study behaviors without missing important instruction. This contrast between allowing control, but limiting it in order to ensure a robust learning environment, is one of the conundrums of the learner control research. As Steinberg (1977, 1989) noted in her reviews, the learner control research has found mixed results. Some research has found that learner control leads to more learning (Gray, 1987; Hannafin & Sullivan, 1995), but other research results are less clear.

Lee and Lee (1991) found mixed reviews within their study. They did a 2x2, fully crossed study to examine learner control versus program control. They also examined learning in knowledge acquisition phases versus learning in knowledge review phases. Fifty-five eleventh grade students participated in computer training based on their chemistry course. In learner control, students could control the number of practice examples and the sequence of tasks and information, whereas program control students could not change any of those elements. Analysis of the main effects indicated that program control proved more effective in knowledge acquisition, and learner control

proved more effective for knowledge review. The results also indicated that learner control is more effective if students have prior knowledge of the content. Furthermore, learner control subjects did poorer on the acquisition tasks than on the review tasks. In the discussion, the authors speculated that this was due to a lack of knowledge about good learning strategies in a learner control environment. Program control students did equally well in the knowledge acquisition and review phases.

Gray (1987) also found mixed results in her study comparing a linear progression course and one that offered many branching opportunities. She found that the learner controlled branching version had a positive effect on comprehension but did not affect retention. Furthermore, the control version resulted in more negative attitudes to the computer program. Gray (1987) speculated that the learners did not really care if they controlled their own learning and that too much control can be complex and distracting. Other research indicates that program control results in more effective learning than learner control. Pollack and Sullivan (1990) studied 152 seventh graders on recall and recognition tasks in learner control and program control environments. They found that program control resulted in higher achievement than learner control on the recognition test. There were not significant differences on the recall test. In contrast to the mixed results for learning outcomes, learner control is usually positively associated with attitudes and motivation. Morrison, Ross, and Baldwin (1992) found that students who could control the amount and context of supplemental practice problems reported more positive attitudes.

Problems with Learner Control Research. The learner control literature stems from educational, technological and psychological fields and varies extensively in quality and robustness. Reeves (1993) claims that, "...much of the research in the field of computer-based instruction is pseudoscience, because it fails to live up to the theoretical, definitional, methodological, and/or analytic demands of the paradigm upon which it is based (p. 39)." He (Reeves, 1993) identified four types of problems that appear in the learner control research.

The first problem is lack of precision in the definition of learner control. Learner control seems to have an intuitive definition, but loose or non-existent scientific definitions make it difficult to accurately study or compare across studies. As part of a scientific construct, the scope and specifics of what the learner can control must be considered. A strong definition would relate to a strong theory base in cognitive science or learning theory (Reeves, 1993; Orey, Garrison, & Burton, 1989). The second problem is that some of the research lacks a theoretical foundation. Milhelm and Martin (1991) also called for a theoretical framework for understanding learner control. A theoretical framework could help explain conflicting empirical results, which may or may not be comparing equivalent concepts. The third problem is that learner control research is frequented by technical and methodological problems. Some of the research manipulations are artificial and unrealistic training situations that do not allow for learners to have sufficient experiences and reactions. The outcome measures are sometimes flawed, because they are not relevant to the training. The fourth problem revolves around analytical issues such as small sample sizes and large attrition rates. Many of these problems can be seen in the research studies reviewed in this study.

Kinzie (1990) also suggests several problems that could be reasons for the variable results related to learner control. One suggestion is that the difference between behavioral and cognitive designs of instruction may lead to outcome differences. Behaviorist designs tend to have more direction, practice and feedback, and they usually focus on near transfer of learning. Cognitive designs tend to have more student control and monitoring of the learning process, and they usually focus on far transfer of learning. These two approaches focus on different levels of instruction and teaching and may not show compatible results. A second suggestion is that individual differences such as ability and prior knowledge influence how learners respond to learner control. These individual differences are often not included in the research studies. A third suggestion is that inexperience and discomfort with learner control can cause learners to respond inappropriately. For instance, a student may decide not to explore the WBT environment, because he is afraid of breaking the computer. Much of the learner control research also lacks a focus on process (Milhelm, 1995). During the learning process, the learner must make choices, but those choices are constrained by the amount and type of learner control provided. Learner choice provides a measure of the learning process, but only a few studies include measures of learner choice (e.g. Hancock, Thurman, & Hubbard, 1995; Lee & Lee, 1991; Milhelm, 1995).

Learning Process and Learner Choices

The learning process can be considered in terms of the strategies used by the student and the behaviors that operationalize those strategies. Strategies are internal processes that learners use to select or modify their ways of attending, learning, remembering, and thinking (Gagne, Briggs, & Wager, 1992). Categories of learning

strategies include rehearsal, organizing, and elaboration (e.g. Fisher & Ford, 1998). Some common concepts as related to the learning process include self-regulation, metacognition, choice, activity level, effort and more. In this study, the learning process was conceptualized has having two types of choices that were made by the learner: behavioral choices (content chosen and amount of activity) and engagement choices (attentional focus and emotional engagement). Before presenting that research model, this section describes other conceptualizations of the learning process and related concepts.

Many recent learning theories have included the concept of self-regulation which is the cognitive process related to the allocation of time and effort to activities directed toward goal attainment (Kanfer, 1990; Farr, Hofmann, & Ringenbach, 1993). Self-regulation theories include goal setting (Locke & Latham, 1990), control theory (Carver & Scheier, 1990) and the integrated information processing/ resource allocation theory (Kanfer & Ackerman, 1989). All of these theories focus on the discrepancy reduction process in which individuals work to reduce discrepancies between self-monitored behavior and some guiding standard. Mastery orientation is suggested to impact the self-regulation process (Farr, Hoffman, and Ringenbach, 1993). Pokay and Blumenfeld (1990) identified three general types of learning strategies: metacognitive, cognitive and resource management strategies. Metacognitive strategies refer to the planning, monitoring and evaluation of one's own cognition. Metacognition is sometimes defined as a latent factor that explains all strategies involving monitoring, learning and adjusting during learning (Brown, 1999). Cognitive strategies refer to integrating new material with prior knowledge. Resource management strategies refer to effort, time use,

environment establishment and help-seeking.

Ford, Smith, Weissbein, Gully and Salas (1998) studied learning strategies in terms of choice of practice in a learner controlled environment. They created a learner control environment and gave 93 undergraduate participants a choice of high, medium or low difficulty practice scenarios. The task was a complex computer simulation of a military radar task which took two days to learn. After the first day of training, the participants could choose what level of practice to receive. They were assessed at the end of the second day with a complex trial designed to measure skill generalization. The results indicated that metacognition was more influential than the other strategies. Students who reported more metacognition performed better on a knowledge test and a final training trial. They also reported higher levels of self-efficacy. Activity level is a learning strategy that reflects the extent to which learners practice a skill or work on a task. Ford, et. al (1998) found that higher activity levels were associated with greater knowledge and better performance at the end of training.

One of the key choices that a learner can make in a learning situation is how much effort to apply (Fisher & Ford, 1998; Steinberg, 1989). Effort can be conceptualized as amount of effort and type of effort. It has been operationalized in many different ways including time on task, mental workload and task persistence. Amount of effort is often measured as time on task. Time on task can be a contaminated measure, because an individual might appear to be working on a task but focusing attention elsewhere (Fisher & Ford, 1998; Dweck, 1986; Steinberg, 1989). Kanfer and Ackerman (1989) offered an alternative measure of attentional focus by considering on-task and off-task mental activity. In addition to amount of effort, type of effort refers to learning strategies used

by individuals such as encoding, organization, and retrieval. These learning strategies are used to encode new information (Gagne, Briggs, & Wager, 1992). Fisher and Ford (1998) found that effort (reported workload) was influenced by mastery goal orientation. Specifically, participants with higher mastery reported greater workload. Participants with high performance orientations spent more time focused on off-task activities. Pintrich (1986) found that effort predicted achievement, whereas metacognitive and cognitive strategies only had an influence as mediated through effort. However, this study did not include any content-specific measures, and the general level of the questions might have distorted the results.

Engagement

In their discussion of teaching effectiveness in distance learning, Webster and Hackley (1997, p. 1284) state that "learning is best accomplished through the active involvement of the students." They indicate that instructors must generate student involvement in order for the course to succeed. This reflects one of the differences between self-paced WBT and instructor-led training. Instructor-led training has a structured environment, which helps keep the learner engaged with the task.

Although self-paced WBT does not have an instructor to maintain involvement, it is a medium that can offer rich graphics, interactivity, personalization and game-like activities. It is possible that WBT is intrinsically interesting enough to maintain learner engagement without need for an instructor. In this study, engagement was operationalized as one type of choice made during the learning process. Learners consciously or unconsciously decided how much attention to focus on the training as well as how involved to become. This study explored the concept of engagement during the

learning process and related it to trainee characteristics and outcomes. This section reviews the literature regarding engagement and discusses it relationship to self-paced WBT.

Engagement has been defined as a motivational outcome that reflects the intensity and emotional quality of a student's involvement and activity during learning (Skinner & Belmont, 1993; Connell & Wellborn, 1991). Engaged students are behaviorally involved in learning and maintain a positive emotional tone. They are more likely to choose difficult tasks, initiate action, and exert effort and concentration (Skinner & Belmont, 1993). By contrast, disaffected students are passive, less involved in learning, give up easily and often act bored, depressed and anxious. Motivational engagement has been defined as having both behavioral and emotional components (Skinner & Belmont, 1993). The behavioral component is reflected by the student's level of involvement, and the emotional component is reflected by positive emotions (enthusiasm, optimism, curiosity, interest) toward the learning experience. Kinzie (1990) incorporated a similar concept called continuing motivation into a key role in her theory of learner control. Webster and Hackley (1997) positioned engagement in terms of Csikzentmihalyi's (1975) theory of flow, which is characterized by perceptions of pleasure and involvement. They included dimensions such as attentional focus, curiosity, and intrinsic interest.

Motivational engagement should be distinguished from cognitive engagement, which is another popular theory in the educational psychology literature. Cognitive engagement refers to the use of learning strategies such as self-regulation (Greene & Miller, 1996; Howard-Rose & Winne, 1993). The concepts presented in relation to

motivational engagement have many similarities to the concept of mastery orientation. For example, both concepts are linked to active involvement in learning, positive emotional tones, choosing difficult tasks and concentration (Skinner & Belmont, 1993; Dweck, 1986).

Skinner and Belmont (1993) describe how the psychological literature and educational literature have approached motivation and engagement in learning from two different perspectives. Psychologists have focused on individual difference issues such as attributions (Weiner, 1986), self-efficacy (Bandura, 1986), and learning strategies (Pintrich & De Groot, 1990). Educational research has focused on teacher behaviors that influence student motivation (i.e. Keller, 1983). They (Skinner & Belmont, 1993, p. 572) believe that the research has advanced such that, "…a perspective on motivation is emerging at the intersection of the psychological and educational literatures." This intersection indicates that motivation is internal to a learner. The social surround (environment and instructor) must fulfill basic psychological needs in order for the motivation to flourish. In their study of engagement in elementary-level classrooms, Skinner and Belmont (1993) did find evidence that the teacher's behavior influenced each student's level of engagement in the learning. This suggests a greater importance on individual differences and their interaction with learner control.

Webster and Hackley (1997) examined student attitudes and engagement in technology-mediated distance learning courses (mostly synchronous, instructor-led, video-based courses). They studied 29 university-credit, graduate-level courses offered for a wide variety of subjects. The researchers collected qualitative and quantitative data for 247 students regarding engagement, self-efficacy, attitudes, technology issues and

instructor and course characteristics. Results indicate that students at the distance learning sites in which the instructor was not on-location had less engagement with the course. They also found that attitudes affected engagement and involvement in the course. These findings reinforce the importance of the instructor, which emphasizes how critical it is to examine the issue of engagement in self-paced learning. The findings also indicate that attitudes are important for engagement.

Measures of engagement vary across studies. The behavioral element of motivational engagement includes effort, attention, and persistence during learning. Fisher and Ford (1998) studied mental effort during training. Mental effort was operationalized as time on task and self-reported attention. This was based on Kanfer and Ackerman's (1989) skill acquisition theory in which attention is focused: on-task, off-task, and on self-regulation. Brown (1999) measured attentional focus through a self-report on-task scale and a behavioral measure of time on task.

The emotional element of engagement refers to emotional reactions during training such as interest, happiness, anxiety and anger. Harp and Mayer (1997) explored the differences between emotional interest and cognitive interest using definitions provided by Kintsch (1980). Emotional interest is encouraged by adding interesting, but irrelevant material (such as cartoons or illustrations), to a lesson. The interesting material is hypothesized to energize the learner and therefore increase her attention, encoding and learning. Increasing cognitive interest involves creating macro-structures (such as explanatory summaries or cause and effect chains) on to which learners can map new information.

Cordova and Lepper (1996) found compelling evidence that engagement can be

enhanced through the types of features available in WBT. They created fantasy embellishments for children's math lessons with a goal to create a context for otherwise abstract learning tasks. They compared outcomes of intrinsic motivation, depth of engagement in learning, performance, and perceived competence for 70 school-aged children who took different versions of a computer-based math training program. The programs varied on the levels of three elements: contextualization specifically fantasy themes (no fantasy, versus space ships and treasure hunts), personalization (references to child's name, friends and favorite toys) and provision of choices (allowed to make small, non-instructional choices). They found that all three elements increased the specified outcomes. This evidence indicates that learning elements that can increase the intrinsic motivational appeal for student can have strong educational benefits. WBT can be intrinsically interesting to a learner if the learner has positive attitudes to the Web and a sense of playfulness. The role of engagement in WBT and its relationship to attitudes and outcomes should be examined in the adult learning arena. Engagement has not been a focus of previous WBT research, but elements of it have been included in some studies (such as attentional focus in Brown (1999)).

Web-based Training Research

Since the Web medium itself is new, there has not been much systematic research concerning the effectiveness of WBT (Craiger & Weiss, 1997). Fortunately, traditional training research and computer-based training research offer some guidance about issues faced in WBT. WBT research tends to be atheoretical and focuses on practical issues (Khan, 1997). One common line of study is case study analyses. Although these provide interesting qualitative information, they do not provide an empirical research base.

The Learner Choice Theory presented by Brown (1999) is an exception in that it is a theoretically grounded, empirically tested model. Brown proposed a theoretical model that addressed learner control by considering the influence of individual differences on learning choices. His model indicated that immutable and malleable individual differences would influence the learner's strategy and effort choices which subsequently influences knowledge gain and post-training attitudes. His empirical test of the model considered the relationships between individual differences (education and experience, learning and performance goals, learning and technology self-efficacy and content utility), the learning process (operationalized as metacognition, activity level and attentional focus) and outcomes (verbal knowledge, change in application knowledge, and application self-efficacy). Brown (1999) defined the learning process in terms of two types of choices: strategy and effort. He operationalized strategy as meta-cognitive activity and measured it through a self-report scale. Effort was conceptualized in terms of attentional focus, time on task and activity level.

Brown's (1999) study monitored 80 employees in a Fortune 500 manufacturing firm who were taking a new Web version of an existing, required engineering course. Brown (1999) hypothesized that learning goals would predict meta-cognition and attentional focus. These hypotheses were moderately supported, but metacognition was not significantly related to any of the learning outcomes. Marginal support for some other hypotheses indicated that learning self-efficacy was related to activity level, and technology self-efficacy was related to attentional focus. Activity level and attentional focus were both marginally related to verbal knowledge. The results were promising for WBT in general and supported or partially supported many of the hypotheses. However,

the results also highlighted some weaknesses in the model and directions for future research. The Brown (1999) model did not develop a strong model that linked individual difference predictors with process variables and process variables with learning outcomes. Elements of the model were supported, but the overall structure was not. The research method was unique and rich in that it collected field data in a controlled environment. However, the disadvantage was that experimental manipulation was not allowed and sample size was limited. The limited sample size along with low scale reliabilities probably contributed to some of the null or marginal relationships. In the current study, these shortcomings were addressed by using a controlled laboratory study that allowed for experimental manipulation as well as allowing for a larger sample size. The research model in this study tested a decision-making model of the learning process in learner controlled WBT. The model included individual difference inputs, process variables, and training outcomes.

FOUNDATION FOR A NEW MODEL

The literature review highlighted the need for robust, empirical research in the areas of learner control, WBT and the learning process. In the next section, a research model and study are presented that attempt to describe the learning process in relation to individual differences, manipulation of learner control, behavioral and engagement choices and learning outcomes. In this section, some of the weaknesses in the existing research are discussed in order to provide a rationale for the new research model. The foundation and rationale for this model stem from three primary areas: the lack of theory and research for learner control and WBT; the research conducted by Brown (1999); and the decision to conceptualize the learning process in terms of behavioral choices and engagement choices. The following discussion also provides a preview of some of the theoretical and design choices for the research model presented in the next section.

Lack of Theory

As discussed in the literature review, there a need for strong, theoretical research on the topics of learner control and WBT, and this model and study hope to contribute to the effort. The existing research in learner control has been described as pseudo-science (Reeves, 1993), because it does not meet acceptable standards in terms of methodology and theory. Some of this criticism seems to be valid. The learner control research does not seem to have a strong theoretical foundation that allows for researchers to conduct complementary and comparable studies. In some cases the studies seem to be atheoretical and opportunistic in that they are designed to take advantage of a data collection opportunity. The data collection environment seems to dictate the research

questions and limit the manipulations. Many of the studies were also completed with school-aged children. This restricted the ability to perform some manipulations and also limits the generalizability to adult learners. Even with these criticisms in mind, the existing learner control research does offer some good guidance for future researchers. It has identified some relevant variables and relationships and uncovered some of the challenges associated with learner control research. As always, good research is an iterative process with new studies building on the knowledge, guidance and mistakes of previous studies. The criticisms of the learner control research highlight the need for a good definition and clear operalization for learner control as well as a theory-based research model. This study proposed a definition of learner control based on the concept of non-linear training. It also empirically tested a model in a laboratory session. This type of basic research could provide a common foundation for future research in field settings.

Existing definitions of learner control, and the research itself, are often not tied to a theoretical base (Milhelm & Martin, 1991). The current theory and model addressed these issues by providing a rich definition and theoretical base. The definition of learner control used in this paper was based on the framework in Figure 1, and it was defined as, "...a form of non-linear training that gives some control of the instructional event to the learner." This definition was built from the theory and definition of non-linear training as discussed earlier.

The literature review (Kinzie, 1990) also highlighted the need to include individual difference variables, and several (mastery orientation, Web self-efficacy, attitude toward WBT, microcomputer playfulness) were included in the new model.

Mastery orientation and Web self-efficacy have been found to influence variables in past research (Brown, 1999), so they were included in the new model. It was hoped that attitude toward WBT and microcomputer playfulness would explain further variance in the learning process and outcomes.

In addition to the need for individual difference variables, the review showed a need for a focus on the learning process (Milhelm, 1995). The model presented in the next section is a process model that used a decision-making framework to predict choices made by learners. This process model used a research design that allowed actual behavioral choices to be monitored by using the computer to track the path taken by the learner. Existing research literature was reviewed that discussed the learning process in other terms such as cognitive strategies (Gagne et al, 1992), self-regulation (Kanfer, 1990), meta-cognition (Pokay & Blumenfeld, 1990) and choice (Ford, et al., 1998). These theories and motivational theories (cognitive choice and intrinsic motivation) that are discussed in the next section provided the foundation for this new process model. Familiar elements such as activity level and attentional focus were included in this model, but they were re-conceptualized into a new model that defined them as behavioral and engagement choices.

How was learner control be conceptualized in this study? In order to achieve operational clarity, it was important to specify how learner control was manipulated and studied in the proposed model. In this new research model and study, learner control was a manipulation in which some participants got a lot of control over their learning and other participants got less control. This methodology was most similar to the learner versus program control studies described in the literature review. Some researchers

believe that this comparison (between learner and program control) is a moot issue, and research should focus on more advanced questions. Chung and Reigluth (1992) wrote that the "…challenge is not whether or not learner control should be used, but rather how to maximize the learner's ability to use the learner control available and to decide what kinds of learner control to make available (p. 19)." Although this is an admirable attempt to advance the research, it is based on some unsubstantiated assumptions. One assumption is that learner control is beneficial and contributes to learning. The mixed results of the learner control research do not clearly support this assumption. Another assumption is that learner control is understood as part of the learning process, such that a learner could be taught to maximize its benefits. Another implicit assumption is that the individual differences that relate to learner control are well enough understood to maximize an individuals use of learner control. In the development of this research model, it was determined that these assumptions have not yet been clearly proved or demonstrated through robust research.

If learner control can occur on a continuum of amount of control, it is important to understand the optimal level of control. This study offered control to both conditions, but some learners were more limited. In the limited learner control condition, the program directed the participant's learning. All participants had access to the same material, but some were forced to view it and others could control how and when they viewed it. The operalizations of the constructs were carefully designed in order to avoid confounding the manipulation and the measures. For example, the low learner control participants were required to complete some exercises that were not required of the high control participants. Completion of the required exercises was not counted as part of the

activity level or content search measures, since one condition was constrained in that choice. It was possible that high learner control would be a negative influence on learning if it allowed people to bypass carefully constructed lesson designs and miss important information. Additional research is needed around the basics of learner control, before the next level of research is examined.

During the early, idea-generation stage of this study, the focus was on the concept of engagement. Specifically, the interest was on interventions (such as embedded encouragement messages or a friendly character that provided a personalized form of social interaction) that could keep a learner engaged with the material in a self-paced Web-based training environment. Engagement was expected to encourage the learner to take advantage of the learning opportunities in learner control and non-linear design. However, while trying to build a research case to support the concepts of engagement and learner control, it was realized that there was not a good theoretical justification for that model. It was hard to justify engagement interventions to enhance learner control when there was not clear evidence that learner control improved performance or learning. The learner control research does not show any clear-cut outcomes for learner control. Although some researchers have found that learner control improves learning (Gray, 1987, Hannafin & Sullivan, 1995, Kinzie, Sullivan, and Berdal, 1988), other have found that it leads to less learning or mixed results (Pollack and Sullivan, 1990, Lee and Lee, 1991). In view of these issues, it was determined that additional, basic research with well-defined concepts and robust design on learner control was warranted. It is important to clearly understand the benefits and disadvantages of learner control, before designing interventions to enhance it.

This study attempted to help determine whether or not there were behavioral and engagement differences between people who had many options and people who did not have many. Specifically, would the learning process differ for learners in high control versus learners in low control environments? The learning process was the real focus of this research, so the emphasis was on the choices and behavior of the learners during the course. The manipulation examined how course design as well as individual differences interacted to influence learning and performance in training. In this study, all of the participants had some level of control over the course. For low learner control participants, the core learning was controlled, but some peripheral activities (such as accessing the glossary, help and resources sections) were under the learner's control. It was possible that learners would perform just as well or better in the limited, low control environment as they did in the high control environment. Although it did not manipulate learner control, one model that provided a foundation for this new model is the Learner Choice Theory model and research developed by Brown (1999).

Comparison to Brown (1999) Model

The Brown (1999) study provided a conceptual and empirical framework for studying WBT, and the research results suggested some future directions for research. The research model and study presented in this study built from the foundation provided by Brown (1999), but made some important changes to the model and approach. The most significant changes occurred in the conceptualization of the learning process, the move from a field setting to a laboratory setting which allowed experimental manipulation of learner control, the addition of the concept of emotional engagement, and the introduction of new individual difference variables.

The Brown (1999) study examined the learning process in terms of learning strategies, specifically metacognition, activity level and attentional focus. Some theories indicate that learners use strategies such as those as well as rehearsal, organizing and elaboration in order to improve their learning, remembering and thinking (Gagne, Briggs, & Wagner, 1992; Fisher & Ford, 1998). Brown (1999) used a measure of metacognition in his research to represent the learner's strategy. Metacognition is a super-ordinate strategy that involves self-monitoring of one's learning strategy as well as use of the strategy itself. The data did not show a significant relationship between the metacognition learning strategy and learning. The Learning Choices theory also considered behavioral and cognitive effort choices to be part of the learning process. In the research, these were operationalized as activity level and attentional focus, and they did have marginal relationships with learning. In assessing these findings related to meta-cognition, activity level and attentional focus, it was noted that the meta-cognitive strategy was a non-significant process variable. As a result, this study changed focus from the meta-cognitive strategy to a focus on behavior and engagement. Furthermore, the variables in the learning process were re-categorized (as either behavioral or engagement choices), and new measures were added to each category.

Activity level was a promising variable in the Brown (1999) study, so it was retained as part of the behavioral choice measure with some modification. The behavioral choice measure was refined into two variables to provide a finer distinction between activity level and content choices. Brown measured the activity level of the participant in terms of the percentage of total activities completed. These activities were limited to a list of pre-defined activities, so the measure did not capture any other actions

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or behaviors such as accessing extra learning resources. In this new study, activity level was operationalized as the number of Web pages accessed by the learner. This measurement captured additional actions such as accessing a glossary definition or using the help section. It provided a broader measure of how much activity the learner did, including accessing supplemental learning materials. A measure similar to the one used by Brown (1999) has been re-defined as a content choice measure. Brown indicated that he was not able to provide a measure of the quality of the activities completed. Specifically, he was lacking a measure of whether or not the participant was choosing the best or most useful activities for learning the material. This study included a measure of content choices that did assess the quality of choices by modifying activity level measure used by Brown. The measure calculated the percentage of pre-defined, high-quality information choices chosen by the learner. High quality information choices were required to meet two criteria: that they were related to information contained in the learning objectives and that they were tested in the pretest and posttest. The difference between this measure and the activity level measure used by Brown was the quality aspect of the designated activities. By contrast, Brown (1999) counted the completion of all non-required activities in the course into his percentage measure. In this study, the content choice activities had to meet the two criteria for high quality information choices. This provided a measure of whether or not the learner could discern the most important content in the course and then choose it. The operalization of behavioral choices in the learning process consisted of two variables: activity level (number of pages accessed) and content choices (percentage of high quality information choices made).

In addition to behavioral choices, engagement choices were expected to occur

during the learning process. A learner made an engagement choice (consciously or unconsciously) about how much attention and focus to exert during the course and how much to enjoy the experience. In Brown's (1999) study, attentional focus showed promise with marginal relationships to self-efficacy and learning outcomes. Consequently, it was one of the variables in the engagement choice along with emotional engagement. Emotional engagement was measured by a scale created for this study based on existing scales that measured interest and flow and emotional involvement during training. The engagement construct is discussed in more detail in the Conceptualization of the Learning Process section.

In addition to the changes in the conceptualization of the learning process, the current study differed from Brown (1999) in terms of research setting, manipulation of variables and the individual difference variables included. The Brown (1999) study traded the control of a laboratory experiment for the reality of a field setting. Although this provided field data, this choice limited the opportunity to collect certain data, manipulate variables and access a large sample. Since WBT is a new research area, it is also important to get a strong research foundation in a controlled environment. Therefore, the current model was tested in a laboratory setting. This allowed an experimental manipulation of learner control, which was expected to increase the impact of the variable. In his discussion, Brown (1999) also discussed the importance of finding individual differences that would predict learning activity. He found promising results for learning goals (mastery orientation) and self-efficacy, so these variables were retained with some modification. This research model also introduced several new individual difference variables such as attitude toward WBT and microcomputer playfulness, which

were hypothesized to influence the learning process due to the novelty of the medium. Since the Web is a new medium, it was expected to have some intrinsic interest for some people. The attitude towards WBT and microcomputer playfulness variables were hypothesized to predict more activity and involvement in the learning process which was expected to result in better outcomes. The current study differed from Brown (1999) in regards to the conceptualization of the learning process, research setting, and manipulation and choice of variables.

Conceptualization of the Learning Process

In this research, the learning process was defined in terms of the choices made by the learner during the training. Learners faced two primary types of choices: behavioral choices and engagement choices. Behavioral choices were reflected by the physical actions completed by the learner during the session. In this study, the behavioral choices were measured by monitoring where the learner clicks during the WBT course. Behavioral choices included a choice of how much activity to do and a choice about which content to view. This type of measure had been included in previous research and has had relationships with individual difference variables as well as learning outcomes (Brown, 1999). The second type of choice in the learning process was the concept of engagement. The concept of engagement as described in this theory had not previously appeared in the learner control and WBT research. This section briefly reiterates the importance of engagement to the learning process in learner controlled courses, and also distinguishes between behavioral and engagement choices.

Most learner controlled courses are also self-paced learning, which puts the burden of maintaining interest, focus and attention on the learner instead of on an

instructor. Previous learner control research often focused on cognitive strategies and behavior experienced during the training. What seemed to be missing was a more abstract, even emotional, description of what the learner experienced during training. What was the learner feeling? Was she interested enough to pay attention and learn the material? Were there other distractions in the room? Was she bored by the material? Was she clicking the buttons and selecting exercise answers without really engaging with the material? It seems reasonable that a minimum amount of internal or intrinsic interest, focus and attention would be critical for success in a learner controlled course, since the teacher and classmates are not available to provide external motivation.

This concept of interest, focus and attention can be operationalized in terms of engagement. Engagement provides a measure of the intensity and emotional quality of a student's involvement and activity during learning (Conner & Wellborn, 1991). It has been linked to behaviors such as students exerting more effort, initiating action and concentrating better (Skinner & Belmont, 1993). These behaviors are important parts of the learning process. In this research, engagement choices included the choice of amount of attention to pay to the material and the choice about how emotionally involved to become in the training. Attentional focus has been measured in previous research (Brown, 1999), but emotional engagement has not been incorporated. Together, these two types of engagement choices could explain some of the discrepancies and missing variance in the previous learner control studies.

Skinner and Belmont (1993) found that engagement is related to behavior during training. These findings indicated that engagement and behavior are separate, but related, concepts, but very few studies actually included engagement. Behavioral choices are the

actions (such as accessing a new page) done by the learner during the training and can be measured objectively. Engagement choices are less objective and provide a measure of the emotional and motivational state of the learner. Behavioral and engagement choices are separate aspects of the learning process that are expected to have differential relationships to inputs and outputs of the process. Discrepancies in the learner control research could be occurring, because the researchers have not included the concept of engagement in their models. Certain inputs and outcomes might have stronger or different relationships with engagement, and previous models have not captured that variance. By not separating the concepts, previous researchers might have been confusing the results. In summary, this model defined the learning process as consisting of behavioral and engagement choices and expected those two types of choices to have differential relationships with input and output variables. The need for theory in learner controlled WBT, modifications to the Brown (1999) model and the new conceptualization of the learning process provided the foundation for the following research model.

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RESEARCH MODEL

In response to the need for more robust research, a model and study were developed that used a motivation-based, input-process-output framework to investigate the learning process in a self-paced, learner controlled WBT environment. In this section, an overview and the model itself are presented, followed by detailed discussions of the variables in the model. These discussions highlight the motivational foundation of the model, the decision-making framework and techniques used in the study. The experimental design for investigating these hypotheses is presented in the Method section.

Motivational Foundation

As the literature on learner control and self-paced learning was reviewed, it became apparent that many of the ideas had a motivational foundation. Motivation theory provided insight into two of the main concepts in this study: learner control and engagement. With learner control, a course offers choices to the learner and the learner must decide what choices to make, how many to make, and how much effort to expend. All of these choices are likely to depend on the motivation of the learner. Motivation can also affect how the person feels during the experience, which can lead to different outcomes. In this study, the motivation of emotions and affective variables were operationalized in part through the engagement choices.

Motivation is often discussed in terms of its three most common and measurable dependent variables: direction of behavior, intensity of action and persistence of direction-specific behaviors over time (Kanfer, 1990). Direction refers to what a person

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does, such as the choices made in training. Intensity refers to how hard a person works, such as amount of activity or effort and focus. Persistence refers to how long a person works or the ability to finish a task. The outcomes of motivational processes are the overt and covert behaviors of the person (Kanfer, 1990). This is an important definition, because performance is not the primary outcome of the motivational process. Performance measures the success of the behaviors, whereas the results of motivational processes are the behaviors themselves. This distinction fits well with the process model of learning presented in this study. The motivational foundation influences the process choices or behaviors, which in turn have an impact on performance outcomes. Several theories of motivation seemed relevant to this study including cognitive choice and intrinsic motivation theories.

Cognitive choice. Cognitive choice approaches to motivation focus on cognitive processes involved in decision making and choice. For example, some cognitive choice theories explore the expectancy (E) and value (V) of choices (Kanfer, 1990). Expectancy refers to the odds of receiving an outcome and value refers to the positive or negative aspect. Both of these aspects are involved in making choices. The choices and actions made by people depend on subjective expectations and subjective valuation of expected consequences of alternative actions. E x V theories assume that people behave hedonistically when choosing tasks or level of effort. They try to maximize positive affect by engaging in behaviors that attain positive outcomes and to minimize negative affect and outcomes. E x V models focus on individual, purposeful choices instead of task behavior or performance (Kanfer, 1990). Each choice made by a person could have a different outcome depending on situational constraints and differences between choices.

E x V models focus on choices made by people and have often been used to predict decision making. Campbell and Pritchard (1976) defined motivation as a label for the determinants of: the choice to initiate effort on a certain task, the choice to expend a certain amount of effort, the choice to persist in expending effort over time. These three determinants were all measured by variables in the study in order to better understand the choices made by the learner. Specifically, choice to initiate effort translated to content choice in this study. The course recorded whether or not the learner chose to do certain tasks (such as click a link or complete an exercise). Choice to expend a certain amount of effort was operationalized with attentional focus as a measure of mental effort. Choice to persist was captured through the measure of overall activity level, which provides an overall measure of effort over time. The model in this study was designed based on a decision-making framework, and used many of the E x V concepts. See the description of the process element of the model in the next section for more details.

Intrinsic motivation. Motivation can also be considered in terms of the orientation of the motivation such as "why" the person is motivated. The same behavior could be caused by intrinsic or extrinsic motivation. With intrinsic motivation, the behavior is done, because it is inherently interesting or enjoyable. With extrinsic motivation, the behavior is done, because it leads to another outcome (such as a reward; Ryan & Deci, 2000). For example, a learner could be intrinsically motivated during a WBT course, because he or she enjoyed the content and was interested in the novel medium. By contrast, the same learner could be extrinsically motivated during the course in order to get praise from a parent or receive a high grade. Conceivably, either of these motivational states could lead to the same behavior and performance in the class. In a

self-paced learning environment such as this WBT course, intrinsic motivation could play an important role in learner behavior.

Some researchers defined intrinsic motivation in terms of a task being interesting, and others defined it in terms of the satisfactions gained by the person (Ryan & Deci, 2000). This study included both of those indications, such that mastery orientation considered individual differences in the interest of learning and engagement considered happiness and satisfaction during the learning process. Additionally, intrinsic motivation can be related to reactions to learner control and other choices made by learner during the learning process.

Intrinsic motivation has been described as a need-motive-value approach to motivation (Kanfer, 1990). Malone and Lepper (1987) sorted intrinsic motivation theories into three groups. The first group consisted of theories emphasizing curiosity, incongruity and discrepancy motives in which there is a need for stimulation and arousal. The second group involved the need to demonstrate competency and mastery. The third group focused on need for personal control over the environment and self-determination (e.g. deCharms, 1968). The third group seemed to relate directly to learner control. Both concepts (intrinsic motivation and learner control) involved control over an environment, but learner control focused on a training environment.

Csikszentmihayli (1975) presented an alternative view of intrinsic motivation. He did not assume a static view of motivation, instead he described motivation as a dynamic state that ebbed and flowed over time. He coined the term "flow experiences" to describe periods of positive, intrinsically motivated behavior in which people were very focused, goal-oriented and in control over the activity. In the current study, engagement choices

during the learning were intended to measure a concept very much like "flow". Engagement was intended to capture amount of focus as well as positive feelings during the learning. This framework provided a link between control and engagement concepts.

Nix, Ryan, Manly and Deci (1999) also presented a concept that linked intrinsic motivation, control and positive emotion. Their theory was based on subjective vitality, which they defined as the positive feeling of having energy available to oneself. This energy was enhanced due to intrinsic motivation, which kept experiences from being draining. They hypothesized that people who controlled their own behavior would feel happy, content and pleased and this would lead to greater energy. The researchers (Nix, et. al, 1999) discussed control in terms of autonomous behavior. Learner control could be defined as a form of autonomous behavior, because the learner is choosing how he or she will behave. Other researchers have also indicated that autonomous behavior can lead to more personal investment and positive experiences (deCharms, 1968; Ryan & Connell, 1989).

Summary. Many of the concepts included in this model and study had a motivational foundation. The cognitive choice and intrinsic motivation theories both offered guidance about the relationships between control, emotions and behavior. The cognitive choice theories raised the issue of considering the effect of expectancy and value on choices and decision making. Campbell and Pritchard (1976) presented three determinants decision making that were operationalized in the study described in the next section as: content choice, attentional focus and activity level. The theories of intrinsic motivation highlighted the importance of considering "why" the person is motivated – for intrinsic or extrinsic reasons. Since the environment in the study was a self-study

environment, intrinsic motivation seemed to be a relevant concept. In this study, intrinsic motivation in learning was captured through the individual difference variable of mastery orientation. Intrinsic motivation can also be seen as part of the engagement variable which measured satisfaction during the learning process (Ryan & Deci, 2000). The work of de Charms (1968) also linked intrinsic motivation to control as represented through learner control in this study. Many of the specific elements in this model and study as described in the next section relied on these motivational concepts.

Overview of the Model

The model presented in Figure 2 considered the influence of learner control and individual differences on the learning process and learning outcomes. The model was designed with an input-process-output format. Individual differences were inputs that were expected to influence behavior and choices during the process, which in turn would influence the final outputs or training outcomes.

Inputs. The primary inputs to the model were four individual difference variables, which included mastery orientation, Web-self-efficacy, attitude toward WBT and microcomputer playfulness. All of these variables were identified as ones which could help explain why learners make different choices during the learning process. An understanding of these variables could help explain differences in learning outcomes as well as help identify people who are likely to be successful in self-paced, learner controlled environments.

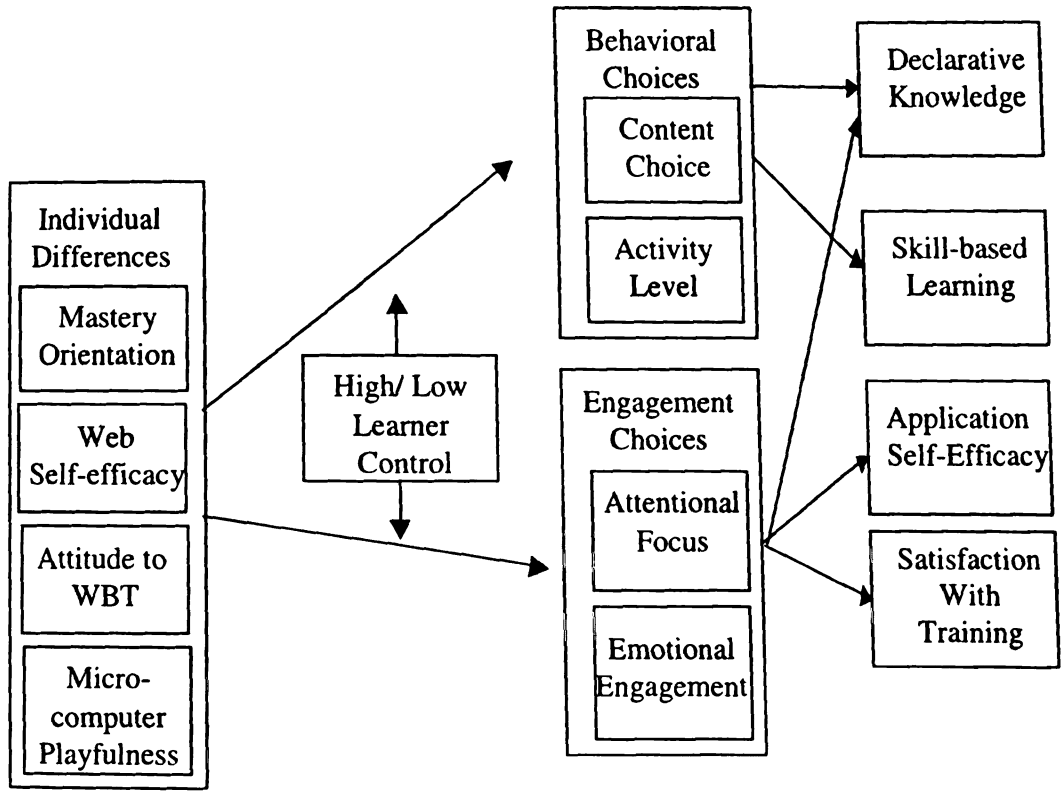

Figure 2. Research Model – Learning Process in WBT

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Process. In order to study learner control issues, it is critical to understand the learning process experienced by the participants (Milhelm, 1995). The research model in this study considers the learning process in terms of choices and operationalizes those choices in terms of a decision-making framework. In the decision-making literature, process models focus on the intervening steps between the introduction of informational inputs and the decisional outcomes (Ford, Schmitt, Schechtman, Hults, and Doherty, 1989). WBT creates an ideal situation for studying training in terms of a process (input-process-outcome) model. The individual differences are the inputs to the model; the behavioral and engagement choices during the learning process can be measured; the learning outcomes are the outputs to the model.

Process tracing methodology used in the decision-making literature was a good fit for the input-process-outcome model presented in this study. In process tracing, the steps leading to the decision are defined by the pre-decisional behavior that is observed. By using this framework, this model can build on the rich process detail in the decision-making literature (e.g. Beach & Mitchell, 1978). The decision-making framework can also provide guidelines for data collection by considering methods used in process models. WBT with learner control can be viewed as a series of decision-making steps. For instance the learner must make decisions such as whether or not to follow the linear order of the modules, to view resource information and to access optional practice exercises. By tracking the sequence and type of these decisions, learning differences between students can be identified.

Many decision-making theories focus on absolute outcomes that can be categorized as either correct or error choices (for example, see Payne, 1982). When a

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learner takes a Web-based training course, he or she must make a series of small decisions about what step to take next. These decisions are usually not "correct" or "incorrect", but they can be used to assess the learner's thought process. From a cost/ benefit, contingency model perspective, these types of process steps are not highly significant decisions, since the decisions can be reversed and the learner is in control (McAllister, Mitchell, and Beach, 1979). Based on those characteristics, the contingency model would indicate that these simpler decisions are made by applying simple rules and heuristics. Although the decision making may not be complex in WBT, the process can be analyzed in order to study learning. Since the decision making is less complex, this research does not require the sophisticated methodology employed in the many decision-making studies.

The current model was a process model in that it focused on the steps chosen to proceed through the course, as opposed to only focusing on the final decision. Process models focus on the steps that occur after input variables are introduced and that lead to decision outcomes (Ford et al, 1989). When studying process models, it is important to collect processing data as often as possible during the decision-making (Svenson, 1979). These data are traditionally collected via the two primary process tracing methods: verbal protocols and information boards. Verbal protocols require decision makers to think aloud during the process, and information boards require them to explicitly search for information within available alternatives.

Web-based training provides an opportunity to collect processing data through a third method. If designed properly, a WBT course can record the path, choices and timing used by the learner to proceed through the course. The computer can track data

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such as: the order in which modules were accessed, number of exercises completed, number of times reference materials were accessed, time spent in each section and the overall course as well as performance data. This information can be operationalized to represent the learning that occurred during the training. Learning inputs and outcomes can be correlated with the type and amount of activity done by the learner.

In a processing model, the key elements of the learning process for the course must be identified. In their review of the process tracing literature, Ford et. al. (1989) defined the salient features of the search process to be (1) depth of search, (2) sequence of search, (3) content of search, and (4) latency of search. Depth of search refers to the total amount of information searched. Sequence of search refers to the temporal pattern in which the information is acquired and assessed. Content of the search refers to an analysis of the specific content of the information acquired. The latency of the search refers to the amount of time spent examining a specific piece of information and/ or to make a final decision. These features of the learning process can be measured by tracking the learner's progress.

This current study incorporated two of these search process features to operationalize the behavioral choices: depth and content. Depth of search was operationalized in terms of the activity level of the learner, which provided a measure of the overall amount of activity. Content of search was operationalized in terms of whether or not the participant accessed optional, but relevant material. Specifically, the computer tracked whether or not the learner accessed specific information or exercises that had been designated as critical learning information. Critical learning information was defined as information that was tested in the pretest and posttest and highlighted in the

learning objectives in each module. Sequence of the search was not included in this study, because it would have been confounded with the learner control manipulation (the sequence of some learners was restricted). Latency of the search was operationalized in terms of the time spent viewing critical learning information, but the measure was not used in the final analyses.

Another part of the learning process was the level of engagement of the learner. Learners make choices about how engaged to become with the training. Skinner and Belmont (1993) defined engagement as having a behavioral and emotional component. The current model presented two similar components of engagement – attentional focus (how much attention the learner focused on the training and material) and emotional engagement (the positive or negative tone of the learner's involvement in the course).

Outputs. The model indicated that the learning process variables were expected to influence several different outcomes, including declarative knowledge, skill-based learning, application self-efficacy and satisfaction with training. As discussed in later sections, these outcomes were all expected to have importance for self-paced Web-based training. The specific elements of the model and the hypotheses are described in the following sections. The discussion begins by describing the individual differences and the learner control manipulation and continues to describe the outcomes of the model.

Individual Difference Inputs

Beach and Mitchell (1978) developed a contingency model of decision making that presented strategy as being a function of the task environment, characteristics of the task, and personal characteristics of the decision maker. In this case, the task environment was the WBT course, the characteristic of the task was the learner control

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design and the personal characteristics of the decision maker was the individual differences of the learner. The task environment (the course) was consistent across the learners, since they all took the WBT course. The characteristic of the task varied across the learner control manipulation with some learners having more control options than others. Within and across the two manipulation groups, additional variance was expected to occur due to individual differences. People respond differently to situations based on individual characteristics (Mischel, 1977), so they are a critical part of understanding the learning process. Kinzie (1990) also highlighted the need to include individual differences in learner control research. Several individual differences were hypothesized to predict variations in the learner's behavior, engagement and learning outcomes in this model. As discussed in more detail below, these individual difference variables included mastery orientation, Web self-efficacy, attitude toward WBT, and microcomputer playfulness.

Many variables have been hypothesized to influence the learning process and training effectiveness such as self efficacy, trainee attitudes, interests, values, and expectations (Noe & Schmitt, 1986). Warr and Bunce (1995) conducted a longitudinal training study of 106 managers to test the influence of 11 trainee characteristics on learning scores, reactions to training and changes in rated job behaviors. They found that general positive attitudes to the training led to better learning scores. Noe and Schmitt (1986) found that job involvement had an influence on learning and indirectly on performance. Noe (1986) proposed that attitudes such as reactions to training assignments (such as assessment feedback), career and job attitudes and expectancies influences motivation to learn which in turn influences learning.

Trainee characteristics are often not the primary focus of research studies, instead the data are collected in conjunction with other theories. However, a recent study attempted to analyze the research concerning trainee characteristics and their influences on motivation to learn and training outcomes. Colquitt, LePine, and Noe (unpublished) conducted a meta-analysis in order to test the Noe (1986) model and examine the research in 106 studies on trainee attributes and attitudes. They found support for many of the relationships. For instance, they found anxiety had a strong negative relationship to motivation to learn ($\underline{r}_c$ = -.57) and to self-efficacy ($\underline{r}_c$ = -.57). Anxiety had weaker relationships to declarative knowledge ($\underline{r}_c$ = -.16), skill acquisition ($\underline{r}_c$ = -.15) and reactions ($\underline{r}_c$ = -.23). Self-efficacy was found to have strong relationships with motivation to learn ($\underline{r}_c$ = .42), declarative knowledge ($\underline{r}_c$ = .30), skill acquisition ($\underline{r}_c$ = .32), post-training self-efficacy ($\underline{r}_c$ = .59), motivation to transfer ($\underline{r}_c$ = .33), actual transfer ($\underline{r}_c$ = .47) and job performance ($\underline{r}_c$ = .22). These results demonstrate the importance of individual characteristics on the training outcomes.

Theories such as the person-situation interaction theory by Michel (1977) indicate that different environments or situations can influence the characteristics of a person, such that the individual will think and act differently in different situations. In this research model, the situation was the learner control manipulation. It was hypothesized that individuals who were high and low in the individual difference variables would react differently to the high and low learner control manipulations. Furthermore, these reactions would differ between the behavioral choices and the engagement choices. Learners who had low scores on the four individual difference variables were expected to respond differently to the high/ low learner control manipulation while making

behavioral choices but were not expected to be influenced while making engagement choices (they would always have low engagement responses). In contrast, people who were high in the individual difference variables were expected to be influenced by the high/ low learner control manipulation in making their engagement choices, but not when making their behavior choices (they would always have high behavioral choices).

Mastery Orientation. One important individual difference variable related to the learning process is mastery or learning orientation. Mastery orientation describes how people approach learning tasks, and it has been shown to influence persistence, focus, and achievement. People with mastery orientations believe that effort leads to successful outcomes, and that their ability for a task can be improved (Ames, 1992; Dweck, 1986). They engage in learning activities in order to understand the new task or concept and enjoy the challenge of learning. In contrast, people with performance orientations are less interested in learning the task and more interested in performing better than their comparison group. Performance oriented people believe that successful outcomes come from high ability and that their ability for a task is fixed and cannot be improved (Ames, 1992). Research has indicated that mastery and performance learning orientations are two conceptually and statistically separate dimensions (Button, Mathieu, Zajac, 1996).

Much of the research on learning orientations was conducted in classroom settings. These results indicated that classrooms emphasizing mastery goals encouraged students to use more effective learning strategies, prefer challenging tasks, approach the class more positively and believe that success follows from effort. Furthermore, mastery goals encouraged students to persist when faced with errors or difficulties. In contrast, classrooms emphasizing performance goals encouraged students to focus on their current

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ability level, evaluate their ability negatively, and attribute their failures to lack of ability. Performance oriented goals lead students to avoid challenging tasks and have less persistence when dealing with difficulties (Ames & Archer, 1988; Dweck, 1986; Dweck & Leggett, 1988; Elliott & Dweck, 1988).

In the classroom studies, learning orientations were usually manipulated as situational variables (Dweck, 1986). However, learning orientations can also be considered trait variables or individual differences. A recent paper classified learning orientation as, "...a somewhat stable individual difference variable that may be influenced by situational characteristics (Button, et al., 1996)." The dispositional learning orientation predisposes people to act a certain way, but the response patterns can also vary across situations. Some recent research indicates that goal orientation can function as a trait or a state variable, but the constructs are distinguishable (e.g. Fisher, 1998). These studies indicate that goal orientation might have a fixed, individual component and a malleable component that is situation specific. For the purposes of this study, learning orientation was treated as an individual difference trait.

Students with a strong learning goal orientation should be more intrinsically motivated to learn in a training program if the program is perceived to be building competence (Farr, Hofmann, & Ringenbach, 1993). Mastery orientation has implications for the learning process such as amount of effort expended. Fisher and Ford (1998) found a link between effort and mastery goal orientation. As mentioned earlier, learners with high mastery orientation are more likely to explore a task and have intrinsic interest in learning (Ames, 1992; Dweck, 1986). Therefore, participants with high mastery orientation scores were expected to access more of the critical learning content and do

more activities overall. The higher intrinsic interest was also expected to result in more engagement choices, such as more attentional focus and higher emotional engagement.

> H1: Participants with high mastery orientations will make more of the targeted content choices, have a higher activity level, have more attentional focus, and have more emotional engagement than participants with low mastery orientations.

Self-Efficacy. Self-efficacy refers to an individual's belief that he or she can perform a specified behavior (Mathieu, Martineau, & Tannenbaum, 1993; see Gist & Mitchell, 1992 for a more extensive review). Social cognitive theory addresses self-efficacy and indicates that self-efficacy beliefs are expected to influence behavior (Bandura, 1991). A meta-analysis by Sadri and Robertson (1993) found a positive relationship between self-efficacy and performance ($r = .36$) and between self-efficacy and behavioral choice or intention ($r = .30$). Pintrich and DeGroot (1990) found a positive relationship between self-efficacy and two outcomes: cognitive engagement (rehearsal, elaboration and organizational strategies) and performance.

When considering self-efficacy, a specific, target behavior should be identified. Therefore, computer self-efficacy refers to an individual's confidence level in his or her own ability to perform computer-related tasks. Negative emotions such as anxiety or low self-efficacy toward computers can affect how a person approaches a computer-related task and can negatively affect success at that task (Ray & Minch, 1990). Similar constructs have been studied under the names of computer alienation and computer anxiety (Ray & Minch, 1990). Previous research has shown that computer self-efficacy does predict behavioral intentions and actual behavior concerning the use of computer-related technology (Hill, Smith & Mann, 1987). Specific to WBT, Brown (1999) found

evidence that self-efficacy is related to activity level and attentional focus. Web self-efficacy is expected to act similarly to computer self-efficacy and the Brown (1999) measures. Confidence about successfully using the Web training medium is likely to influence the learner's performance. Based on this research, it was expected that people who were confident in their ability to use the Web would perform better in the learning process.

> H2: Participants with high Web self-efficacy will make more of the targeted content choices, have a higher activity level, have more attentional focus, and have more emotional engagement than participants with low Web self-efficacy

Attitudes. Learner attitudes toward a new technology, such as the Web, may influence the success of the new method. Attitudes have been defined as internal states that influence the choice of personal action (Gagne, 1984). They can serve functions such as providing information about reactions to other individual, events or objects and guiding behavior (McCormick & Ilgen, 1985). Attitudes toward training have been found to have significant relationships to learning outcomes (Alliger & Janak, 1989). Attitudes can be inputs or outcomes of the learning process. In the model of learning outcomes proposed by Kraiger, Ford, & Salas (1993), attitudes are classified as affective learning outcomes.

Successful technology implementations (such as introducing WBT) often depend on the attitudes and opinions of users (e.g. Davis, Bagozzi, & Warshaw, 1989). Webster and Hackley (1997), as described earlier, found that attitudes are an influence in distance learning environments and specifically on learner engagement. This model hypothesizes that attitude toward WBT would influence behavior choices and engagement choices.

Learners with positive attitudes to WBT were expected to do more and focus more on the training.

> H3: Participants with positive attitudes toward WBT will make more of the targeted content choices, have a higher activity level, have more attentional focus, and have more emotional engagement than participants with less positive attitudes toward WBT.

Microcomputer playfulness. Webster and Martocchio (1992) introduced and validated a construct called microcomputer playfulness which could also influence learning in a Web format. They saw evidence that attitudes about computers were shifting from a fearful to a positive nature (e.g. Gardner, Young, & Ruth, 1989). Part of this shift could be attributed to the fact that microcomputers can be fun to use once the initial fear is overcome. Computers can encourage a state of playfulness by providing quick responses, ease of use, and personalized features (Webster & Martocchio, 1992; Starbuck & Webster, 1991). They (Webster & Martocchio, 1992) defined microcomputer playfulness as a situation-specific, individual, trait characteristic that describes an individual's tendency to interact spontaneously, inventively and imaginatively with microcomputers. It was proposed that people with high levels of microcomputer playfulness would feel more involved, have a positive mood and experience more satisfaction. Furthermore, it was proposed that playful individuals would require less external stimuli (such as performance feedback) to sustain their motivation. Webster and Martocchio (1992) found internal consistency, concurrent validity, discriminant validity, predictive validity and test-retest reliability evidence to support their seven item scale of microcomputer playfulness. They also found that the measure related positively to computer attitudes, competence and efficacy and negatively to computer anxiety. The measure also related positively to training outcomes of

learning, mood, involvement and satisfaction (Webster & Martocchio, 1992; Martocchio & Webster, 1992).

In this study, it was expected that people high in microcomputer playfulness would have high interest and motivation to perform training in a novel Web-based format. The novel format was expected to make them perform more learning behaviors and engage more with the training.

> H4: Participants with high microcomputer playfulness will make more of the targeted content choices, have a higher activity level, have more attentional focus, and have more emotional engagement than participants with low microcomputer playfulness.

Learning Process Variables

The individual difference variables were expected to influence the learning process of the individuals. The learning process was conceptualized as including behavioral and engagement choices. Behavioral choices include the amount of work completed (activity level) as well as the quality of the work completed (content choice). The Web supports this type of data collection, since the computer can record every click of the mouse or bit of information entered into the course by the learner. Activity level was measured by the total number of pages accessed by the learner during the course, providing a measure of overall activity. This measure assessed the amount of primary and extra information accessed by the participant during the learning session. Every participant who completes the experiment accessed a minimum number of pages in the course. However, there were many opportunities to access more than the minimum number of pages in the course, such as accessing the support material (glossary, resources, help and feedback sections). These support materials were available throughout the entire course, but were not required for completing the course or scoring

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well on the tests or activities. Another opportunity was to use the BACK button to return to earlier information in order to review information. Participants who took advantage of these opportunities and showed more activity were expected to perform better on the learning outcomes. The activity level measure did not include accessing the screens related to the content choice measures. Even so, the measures were expected to be correlated, since a participant who chose one type of optional activity was likely to make the other as well. However, activity level provided a measure of the overall quantity of activity and content choice focused on the selection of targeted, high quality choices. This conceptualization of activity level differed from the Brown (1999) conceptualization which was closer to this study's definition of content choice. Brown (1999) limited his assessment to specific target behaviors, so he did not get a measure of the pure quantity of activity within the course.

Content choice was the second type of behavioral choice in the learning process. Content choice was measured by the percentage of targeted activities completed during the training. The target activities were chosen, because they teach critical learning information. Activities that were considered to teach critical learning information met two criteria: their content was included in the learning objectives for the module and the content was included in the pre/posttest. This was intended to provide an indication of how well the learner discerned and chose critical learning information. Specifically, this measure considered whether or not the participant completed optional exercises, accessed extra learning information or viewed linked vocabulary words. Participants who opted not to access this extra learning information still had all of the information that they needed in order to perform well on the tests and outcome exercises. This measure of

content choice was similar to the Brown (1999) measure of activity level, but the Brown measure did not require included activities to meet any criteria.

The learner also made engagement choices, which reflected the level of involvement and focus of the learner. Engagement choices included the amount of attention focused on the course as well as the level of emotional involvement. Engagement provided a measure of the intensity and emotional quality of a student's involvement and activity during learning (Conner & Wellborn, 1991). Attentional focus has been measured in previous research (Brown, 1999), but emotional engagement has not been incorporated. The attentional focus measure captured the level of concentration that the participant had during the training. It asked about the participant daydreaming during the training. Participants who were not paying attention to the material were less likely to learn well. The emotional engagement measure looked at the participant's level of interest and involvement and emotional state during the training.

Learner Control as a Moderator

Learner control was manipulated in the study, such that some participants had a lot of control and others had only minimal control. Learner control was expected to influence the type of choices (behavioral and engagement) made by the learner. It was hypothesized to moderate the relationship between the individual difference variables and the behavioral and engagement choices made during the learning process. Earlier research (Milhelm & Martin, 1991) indicated that learners should be motivated by having the control to choose relevant information. However, individual differences are also likely to influence how different people respond to this situational characteristic (Mishel, 1977). The influence of the moderation was expected to vary based on high and low

scores for the individual difference variables as well as for the type of choice (behavioral or engagement). All of the individual difference variables were oriented such that high scores were expected to relate to more learning behaviors and more engagement. The moderating effect of learner control was therefore expected to act similarly for each of the four individual difference variables.

Figures 3 and 4 provide illustrations of the hypothesized interactions. As seen in the figures, it was expected that individuals who were high and low in the individual difference variables would react differently to the high and low learner control manipulations. Furthermore, these reactions would differ between the behavioral choices and the engagement choices. Figures 3 and 4 show two general interactions, which apply to all four individual difference variables.

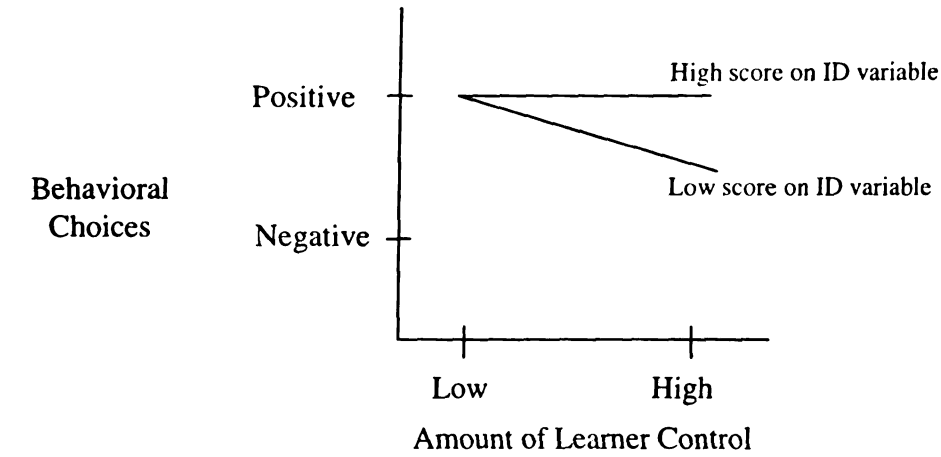

Figure 3. Behavioral Choices Interaction

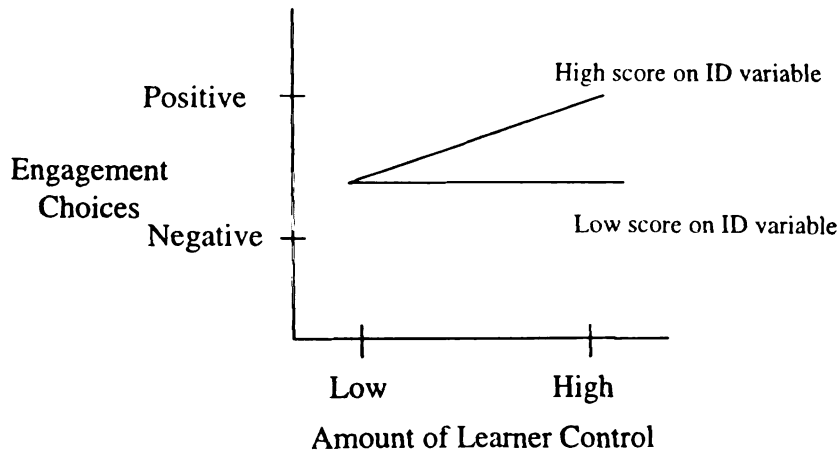

Figure 4. Engagement Choices Interaction

Figure 3 represents all four individual difference variables and how they were expected to relate to behavioral learning choices across the learner control conditions. In this figure, the performance scale reflects behavioral choices that are high (high activity level and more content choices) and low (low activity level and fewer content choices). Figure 4 represents all four individual difference variables and how they relate to engagement learning choices across the learner control conditions. In this figure, the performance scale reflects engagement choices that are high (high attentional focus and high emotional engagement) and low (low attentional focus and low emotional engagement).

Behavioral choices interaction. In comparing Figure 3 and Figure 4, learners who had low scores on the four individual difference variables were hypothesized to respond differently to the high/ low learner control manipulation while making behavioral choices but were not expected to be influenced while making engagement choices. In other words, low scores were expected to interact with learner control to influence behavior but not to cause any interaction that influenced engagement.

Low scores on mastery orientation, Web self-efficacy, attitude toward WBT and microcomputer playfulness were expected to indicate that the participant would be less likely to work hard or show active involvement in the training. Since they would have low intrinsic motivation, the low individual difference score participants were expected to prefer the low learner control condition for behavioral choices. They would not want to expel any extra energy, would want to be told what to do, and would perform the minimum required.

Low individual difference scores were expected to have a flat floor effect on engagement choices, such that no interaction was expected across the learner control conditions. They were not expected to become any more than minimally involved with the training.

> H5: Learner control will moderate the relationship between the individual difference variables and behavioral choices in the learning process. Participants with low scores on the individual difference variables will make more of the targeted content choices and have a higher activity level in the low learner control condition than in the high learner control condition. Participants with high scores on the individual difference variables will not perform differently across the learner control conditions for behavioral choices.

Engagement choices interaction. In contrast, people who were high in the individual difference variables were expected to be influenced by the high/ low learner control manipulation in making their engagement choices, but not when making their behavior choices. People with high scores on the individual difference variables were expected to be more likely to explore the training and find it interesting and involving. These people were expected to make high behavioral choices regardless of the learner control condition resulting in a flat ceiling effect for behavioral choices. They would be as active as possible in either condition. However, this same desire for the control to explore was expected to lead to low engagement choices in the low learner control conditions. Although they would still be expected to perform well, the low learner control/ high individual differences people were expected to resent the low control. These explorers were expected to want to control their learning and show less focus and involvement when denied the opportunity.

H6: Learner control will moderate the relationship between the individual difference variables and engagement choices in the learning process. Participants with high scores on the individual difference variables will have more attentional focus and higher emotional engagement in the high learner control condition than in the low learner control condition. Participants with low scores on the individual difference variables will not perform differently across the learner control conditions for engagement choices.

Learning Outcomes

All attempts to understand and intervene in training situations should be ultimately focused on the end goal or the intended learning outcomes. In order to develop empirically testable variables, training outcomes should be defined as psychological constructs that are distinguishable from learning processes (Brown, 1999). This allows for constructs that can be assessed by different methods, but still link to training interventions and job performance. Training outcomes should also relate to the objectives and structure of the course itself.

For the past few decades, the concept of training outcomes have followed the model established by Kirkpatrick (1974). This model specifies four steps for training evaluation: reactions (how well the trainees liked the program); learning (principles, facts and skills absorbed by the trainee); behavior (changes in on-the-job behavior); and results (organizational outcomes such as improved efficiency). Recent literature has indicated that this model has some conceptual problems (Alliger & Janak, 1989). It is limited because it assumes that the four steps are in ascending order, assumes that the levels are causally linked and it does not provide a clear taxonomy of learning outcomes (Alliger & Janak, 1989).

In response to such criticisms, Kraiger, Ford and Salas (1993) developed a model which divided learning outcomes into three categories: affective, behavioral and

cognitive. Affective outcomes refer to attitudes and motivation that can be influenced during training. Behavioral outcomes refer to skill-based activity including psychomotor skills. Cognitive outcomes refer to verbal knowledge and higher order knowledge organization and cognitive strategies such as procedural knowledge. The research model in this study included all three types of these variables.

Affective outcomes. Affective outcomes refer to attitudes and motivational constructs such as self-efficacy and satisfaction. Attitudes were not incorporated into the Kirkpatrick (1974) model, except in the limited form of reaction ratings. In the Kraiger, Ford and Salas (1993) model, attitudes and motivation are more than just training inputs, since they can also be outcomes. If a trainee's values undergo a change due to the training, then learning has occurred. In previous research, affective outcomes to training have included creative individualism (Schein, 1968), organizational commitment (Louis, Posner and Powell, 1983), group norms (Feldman, 1984), tolerance for diversity (Geber, 1990), and changes in values (Kraiger, Ford and Salas, 1993). Affective outcomes also include motivational constructs such as mastery and performance orientations, self-efficacy, and goal setting. In this model, two affective outcomes were measured: satisfaction with the training and application self-efficacy.

The relationship between satisfaction and learner control has varied in earlier research. Gray (1987) found that learner control led to negative attitudes about the computer program and speculated that too much control was distracting. By contrast, Morrison et al. (1992) found that control led to more positive attitudes. This model hoped to sort out this conflict by providing a finer level of distinction. It was expected that satisfaction would be tied to the level of engagement (which had not been previously

investigated) and not to behavior. As an affective outcome, it was expected that satisfaction would be influenced by the engagement choices instead of the behavioral choices. Satisfaction is an emotional response to how involved the participant was with the training. Recent research indicates that satisfaction is not highly correlated with learning or predictive or transfer (Alliger, Tannenbaum, Bennett, Traver, Shotland, 1997; Warr and Bunce, 1995). Even so, satisfaction is a relevant outcome for training, especially in a new medium such as WBT, which is quickly growing in popularity. Satisfaction is likely to influence whether or not a learner would opt to take future WBT course and could influence the general acceptance of the medium. In this study, engagement choices were expected to influence satisfaction.

> H7: Participants with high attentional focus and high emotional engagement will be more satisfied with the training than participants with low attentional focus and low emotional engagement.

In addition to satisfaction, application self-efficacy was another affective outcome, which was included in the model. In contrast to the satisfaction measure, self-efficacy has been shown to predict transfer. Self-efficacy is an individual's belief in his or her capacity to successfully perform a particular act or behavior. Bandura (1997) suggests that people that are high in self-efficacy for a task are more likely to engage in and persist with that task. Self-efficacy has also been shown to predict the maintenance of new skills (Gist, Stevens and Bavetta, 1991). A measure of self-efficacy for WBT was included as an individual difference input for the model. As an outcome measure, application self-efficacy examines the effect of the learning process on final feelings of efficacy to use the material taught in the course. The confidence that a trainee has after training can influence generalization and transfer.

Brown (1999) did not find a relationship between higher activity levels or attentional focus and application self-efficacy. In order to determine how the learning process influences application self-efficacy, this model considered a finer distinction. Similar to the hypotheses for satisfaction, the affective outcome of application self-efficacy was hypothesized to be related to engagement and not behavioral choices. Due to Brown's null finding for attentional focus, the relationship was only expected to occur with emotional engagement. Specifically, people who were interested and involved in the training were more likely to visualize themselves as using the content in the future.

> H8: Participants with high emotional engagement will have higher application self-efficacy than participants with lower emotional engagement.

Cognitive. Cognitive outcomes encompass the most traditional idea of learning. An accepted definition of learning is "a relatively permanent change in knowledge or skill produced by experience" (Weiss, 1990, p.172). Cognitive learning is often assessed using achievement tests (multiple choice knowledge tests), and can more accurately be described as declarative knowledge. Cognitive learning outcomes are common measures for training research and organizations (e.g. Colquitt & Simmering, 1998; Fisher & Ford, 1998). Some evidence indicates that declarative knowledge measures cannot discriminate among trainees at higher level of experience, but they can be useful in the early stages of skill acquisition (Kraiger, Ford, and Salas, 1993). In this study, behavioral and engagement choices were expected to influence learning (acquisition of declarative knowledge).

H9: Participants who make more of the targeted content choices, have a higher activity level, have more attentional focus and higher emotional engagement will have more declarative knowledge than participants who make fewer of the targeted content choices, have lower activity levels, have less attentional focus and lower emotional engagements.

Behavioral. Behavioral outcomes include skill-based measures. An important concern of training in the workplace is whether or not the acquired skill can and will be used back on the job (Baldwin & Ford, 1988). Skill practice scores have been shown to predict generalization of skill and positive transfer (Ford, et al, 1998). In this study, the skill measure was assessed using transfer application activities. Skill development and transfer were expected to be related to the behavioral choices made by the trainee. More activity and better choices were likely to reinforce skill-based learning.

H10: Participants who make more of the targeted content choices and have a higher activity level will have more skill-based learning than participants who make fewer of the targeted content choices and have lower activity levels.

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METHOD

Participants

The participants were 249 students taking introductory psychology courses from a large mid-west university who received course credit in exchange for participation. Thirteen participants were removed from the analyses due to computer crashes, illness or failure to complete final measures. The final sample size was 236 participants.

Research Design

The design was an experimental study. There were two conditions in the manipulation – high learner control versus low learner control. Some of the data on individual differences, process variables and outcome variables were collected through self-report, online surveys. Other process variables and outcomes were collected through computer tracking and paper-based activities. Although participants took the course during scheduled lab sessions, each participant completed the study individually in a self-study format.

Power Analysis

Many of the relationships hypothesized in this study have not been previously studied, so relationships from similar studies were used to provide a baseline. In terms of attentional focus, Fisher and Ford (1998) found a correlation of -.35 between off-task attention and verbal knowledge. Brown (1999) found correlations between verbal knowledge (pretests and posttests) and time on task and activity variables that ranged from .26 to .45. Many of the significant correlations found in this study fell in a similar, medium effect size. According to Cohen and Cohen (1983), a sample size of 230 with medium effect sizes provided a power of .99 to reject the null hypothesis of no

relationship at an alpha level of .05 for a standard model. This finding provided guidance on needed sample size, but the interactions included in this model made it complicated to asses the true power of the sample size for this model.

Training Course

The course used in this study is called Change Management and teaches basic principles of change in organizations. The course is owned by Learnshare, which is a consortium of Fortune 500 companies that share training resources. Learnshare granted special permission for the course to be used in this research study. The Web-based training version of the course was designed and developed by Strategic Interactive using materials provided by Learnshare. The Change Management course was chosen because the material was suitable for a college-aged audience, the course is based on sound instructional design principles, and it could be modified to allow high and low conditions of learner control.

The original course was modified in several ways to meet the needs of the study. It was significantly shortened from sixteen hours, by removing several "specialty" modules that dealt with specific roles related to Change Management (such as the Leader role). The scaled-down course used modules from the primary tutorial that taught the basic concepts of change management. The shortened course was expected to offer enough interaction with the course to detect differences in learning processes and outcomes. Extra screens were also added that provided information specific to the experiment (such as instructions). The course was modified to allow online collection of the scales and to have the results stored in a database. Special programming allowed the collection of behavioral data such as number of pages accessed (activity level measure),

specific choices made (content choice measure) and time spent in the course. The original course had an option for audio in which quotes and interactions are spoken. For the purposes of the study, audio was not an option – everyone received the text-only version. This maintained standardization across the participants. Finally, two versions of the course were created to provide the two conditions of high learner control and low learner control. Throughout the remainder of this paper, references to the course indicated the shortened version of the course used in the study.

The course was designed with a coffeehouse, conversational theme. The learner enters a coffee shop and reads headlines in the newspaper about change problems that are occurring in organizations. Other coffee shop patrons engage in a conversation about the change problems. These interactions are interspersed by instructional elements that teach the concepts of Change Management. The course includes two primary modules: The Concept of Delta and The Concept of Momentum. In addition, the course includes an introduction, glossary, resources, help section and email feedback. The two modules have learning objectives, text information and interactive exercises. Sample screen shots from the course are included in Appendix C.

Training Technology

The course was designed to be compatible with different computer systems and different browsers, since Learnshare's users come from many different organizations. The technical design specifications for the course called for Netscape 3.0 or Internet Explorer 3.0 or higher and 800 x 600 pixel screen resolution. Data were collected in an Access database, and no sound cards or special plug-ins were required. Computers in the university computer laboratories were well-suited for this course. The course was hosted

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on a server owned and maintained by Strategic Interactive. Strategic Interactive maintained high levels of server and user security. The data were well-secured during the data collection process. Participants accessed the course through the Internet from a university computer lab.

Procedure

Participants signed up for the experiment through the Psychology subject pool web site and through special class sign-ups. A computer lab on campus was reserved for the laboratory sessions. Participants received 2 hours of experimental credit for participating. Many of the participants did not require this amount of time. It was necessary to allow plenty of time, because the participants worked at different speeds through the self-paced course. Participants worked individually in a self-study format, and the researcher did not offer any assistance in completing the course.

The first step of the program was the consent form, which was presented online to the participant who indicated acceptance or non-acceptance of the consent agreement. All participants consented to participating in the experiment. After consent, participants completed the login screen by indicating their name and identification number. The name was only be used to give participation credit to the participants. The final dataset did not include the names; it only contained the student identification numbers in order to provide a unique identifier.

After the login, the computer assigned the participants to either the high control or the low control condition (it alternated every other person). The WBT program started by collecting the individual difference variables (mastery orientation, Web self-efficacy, attitude toward WBT and microcomputer playfulness). The next screen presented

information about the experiment and thanked Strategic Interactive and Learnshare for their assistance. The next screen presented an explanation of the manipulation, which was intended to strengthen the effect. Each person was told which manipulation (you are in the high/ low condition) he or she was receiving. The next step was for the learner to complete the pretest, after which the actual course material and training began. The participant proceeded through two modules and completed exercises along the way. Two process variables (emotional engagement and attentional focus) were collected in the middle of the course between the two modules. After completing the course the participant took the posttest and completed the satisfaction with training scale and the application self-efficacy scale on the computer. After they completed the course and all of the scales, participants saw a screen indicating that the computer section of the study was complete. They received a paper-based copy of the skill exercise from the researcher and completed it. After the final exercise was complete, the researcher provided a description of the study that included contact information for the researcher and dismissed the participants.

Learner Control Manipulation

Participants were randomly assigned to one of the two experimental conditions of high or low learner control. There were 117 participants in the low control condition and 119 participants in the high control condition. The manipulation was reinforced on an introductory page that described the manipulation in general terms and told the participants which type of control they were going to have. Although this reinforcement was artificial, it was intended to have some similarities to real-life situations. As learners become more accustomed to taking WBT, they will learn the range of possibilities for

control and interaction. In future training, they will have a sense for whether or not they have a lot of control in comparison to other courses.

In the high learner control condition, participants had more choices and were able to take advantage of the non-linear aspects of the course. They were able to:

- Review the modules in any order. The course introduced each module and provided links to take participants to either module one or module two.
- Review the content in each module in any order. A breakdown of the module was presented including the tutorial content, exercises and extra information sections. In the high learner control section, these elements were all links allowing the participants to jump to different elements of the course.
- Take or skip the optional practice exercises. Five total exercises were presented in each module, and two of them were labeled as "Required". However, participants in the high control condition were not required to complete any of the five exercises in order to continue.

In the low learner control condition, participants had fewer choices and were forced to learn the material in a more linear progression. They had some control over optional exercises and other learning elements (such as using the glossary), but their progression through the content was more limited. They were forced to:

- Pass through the modules in a pre-determined order (no control). The course introduced each module, but there was not a link to the modules. Participants had to start with module one.
- Review the content in each module in a linear order. The same breakdown of the modules was presented including the tutorial content, exercises and extra information sections. In the low learner control section, these elements were not links, so the participant had to click the next button and proceed linearly.
- Be required to complete the two "Required" exercises. Five total exercises were presented in each module, and two of them were labeled as "Required". Participants in the low control condition were required to complete the two "Required" exercises before they were able to continue with the course. In order to avoid confounding the manipulation and the measures of content choices and activity level, only the three exercises that are optional for both conditions were counted in the measures.

Measures

Online surveys were used to collect the self-report data, except for the skill exercise, which was completed on paper at the end of the study. The web server tracked all other process and outcome variables to an online database. All of the survey scales are included in Appendix A. Table 1 indicates when each measure was collected, the method of collection (self-report (SR) versus computer tracking (CT)) and number of items in the original scale.

Table 1: Collection of variables

	Before Training	During Training	After Training
Individual Difference Variables	• Mastery Orientation (SR, 8) • Web Self-Efficacy (SR, 5) • Attitude toward WBT (SR, 8) • Microcomputer Playfulness (SR, 7)		
Learning Process		• Content Choice (CT) • Activity Level (CT) • Attentional Focus (SR, 6) • Emotional Engagement (SR, 11)	
Outcomes			• Declarative knowledge (SR, 14) • Application SE (SR, 5) • Satisfaction with Training (SR, 8) • Skill-based Learning (SR, essay on paper)

Mastery orientation. Mastery orientation was measured by the eight-item scale developed by Button, Mathieu, & Zajac (1995). The items were rated on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). The eight-item mastery orientation scale had an alpha coefficient of .74.

Performance orientation. Although not hypothesized, performance orientation was also measured as a counter-point to mastery orientation. It was measured using the eight-item scale developed by Button, Mathieu, & Zajac (1995). The items were rated on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). The eight-item performance orientation scale had an alpha coefficient of .82.

Web self-efficacy. Web self-efficacy was measured with a five-item scale based on the self-efficacy scale of Pintrich and De Groot (1990). The scale was modified to measure self-efficacy toward general use of the Web. A sample item is, "I am certain I can master the skills needed to effectively navigate the World Wide Web." The items were rated on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). The five-item Web self-efficacy scale had an alpha coefficient of .87.

Attitude toward Web-based training. Attitude toward WBT was measured using an eight-item scale modified from the Attitude toward the Internet scale used in Howell, Mullins, Fisher, Schmitt, and Kozlowski (1998). The revised scale included items such as, "I enjoy taking Web-based training courses." The items were rated on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). Scale analysis showed that Item 7 was double barreled and did not fit well with the rest of the scale, so it was removed. The final seven-item Attitude toward WBT scale had an alpha coefficient of .86.

Microcomputer playfulness. Microcomputer playfulness was measured using the seven-item scale developed and validated by Webster and Martocchio (1992). This scale presented a list of seven adjectives. Participants were asked to choose the response (strongly disagree to strongly agree) that best matched a description of themselves for

each adjective. In their validation of this scale, Webster and Martocchio (1992), found an internal consistency of .86 to .90 for the seven items as well as finding proof of concurrent validity, discriminant validity, predictive validity and test-retest reliability. The items were rated on a seven-point scale ranging from Strongly Disagree (1) to Strongly Agree (7). In this study, the seven-item microcomputer playfulness scale had an alpha coefficient of .78.

Activity level. Activity level was measured by the total number of pages accessed by the learner during the course. This provided a measure of overall activity including accessing optional screens and referencing support material. This differed from the Brown (1999) operalization of activity level, which was more conceptually similar to this study's definition of content choice. The number of total pages accessed was collected by the computer. In order to keep measure operationally distinct, the final activity level score was calculated by subtracting the number of pages connected to the required exercises and the number of pages counted as part of the Content Choice measure from the total number of pages accessed in the training.

Content choice. Content choice was operationalized using three separate, but related, measures. The first measure was a count of the number of pre-determined activities completed during the training. The pre-determined activities were all chosen, because they taught critical learning information. Activities that were considered to teach critical learning information met two criteria: their content was included in the learning objectives for the module and the content was included in the pre/posttest. This was intended to provide an indication of the quality of effort exerted, because it monitored how well the learner discerned and chose critical learning information. This measure was

similar to the Brown (1999) measure of activity level, but the Brown measure did not require included activities to meet any criteria. There were three exercises in each condition that were optional, so these were included in the count for the content choices (six total). In addition, two extra examples in each module (four total), and eight clickable vocabulary words in the first module and seven clickable vocabulary words in the second module (15 total) were part of the content choice count. Content choice (count) scores ranged from zero to twenty-four.

The second measure of Content Choice was a latency or time measure. The same critical learning information was targeted. However, instead of a count, the measure was the amount of time (in seconds) spent viewing the targeted items. The latency or time measure of content choice ranged from zero to 520 seconds.

The third measure of Content Choice was a combination of the first two. The measure was the average amount of time in seconds spent looking at the target items. Specifically, it was an average calculated by dividing the time measure by the count measure. This was intended to provide a depth of processing measure that differentiated how much attention the individual items were given by the learner. The average time measure ranged from zero to 60 seconds.

Although the range for the measures started with zero, only five of the participants had zero as their content choice score. All of the count and time measures were examined for the possibility of being overdispersed, which would create the need to transform the variables before hypothesis testing. The results indicated that this was not necessary, so the raw scores were used in the analyses. Although all three of the content choice measures were included in the descriptives and correlation analyses, only the

content choice (count) measure was used in the hypothesis testing. See the Results section for a more thorough discussion of these decisions.

Attentional focus. This was measured with a scale similar to the one used in Brown (1999) that asked about on-task and off-task behavior. Attentional focus was the amount of attention devoted to the course materials as opposed to unrelated topics or material. The measure was a self-report Likert scale asking the extent to which trainees thought about the task-related and task-unrelated subjects. The scale was adopted from Fisher (1995) and Brown (1996). It included statements such as "I am letting my mind wander while I was learning the material". Most of the items in this scale were derived from Kanfer and Ackerman's (1989) measure of off-task attention. The six-item measure used in this study was most similar to the measure employed by Brown (1996). Items about attention to off-task topics were reverse scored so that high scores reflect greater task-related attentional focus. Two items (Item1 and Item 6) were removed from the scale due to low item-total correlations and due to loading on a different factor (see factor analysis discussion in the Results section). The final four-item attentional focus scale had an alpha coefficient of .85.

Emotional engagement. Emotional engagement was measured with an eleven-item, self-report scale developed for this study. Skinner, Wellborn, and Connell (1990) measured engagement using a teacher report scale that assessed the level of active participation and the emotional tone during the class. Both of these elements were incorporated into the self-report scale developed for this study. The items were rated on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). Scale analyses and a factor analysis with attentional focus (see factor analysis discussion in the

Results section) indicated that three items (Item 3, Item7, Item 8) should be removed from the scale. This resulted in an eight-item scale with an alpha coefficient of .88.

Declarative knowledge. Learning was operationalized through a measure of declarative knowledge. Learners completed a fourteen-item, multiple choice test that covered concepts from the course. The same test was used for the pretest and posttest and the two test administrations were correlated at r=.28. Declarative knowledge was measured by using the posttest score as a dependent variable in the analyses. The pretest score was entered in the first step of the regression analysis as a control.

Skill-based learning. Skill-based learning was measured using the score on an application exercise. Application knowledge refers to the trainee's ability to apply concepts from the course to new problems. Participants completed two essay activities, which were intended to tap the knowledge taught in the course. The activities were written by the researcher for the purposes of this study.

An answer key was developed for each activity that included target items, vocabulary words and a rating scale. The target items were ones which would be elements of a good answer based on the material in the course. Participants received rating points for each item that they included in their essay answer. They were not required to include all of the target items. The scoring system was tested by comparing results for two scorers on a sub-set of the essays. A correlation between the raters indicated that the raters were consistent in their scoring (r=.91). Based on this indication of the robustness of the scoring system, the essays were all scored by the primary researcher.

For each target item, the participant received a rating based on a three-point scale.

Participants received zero points if they did not mention the target item in their essay. They received one point for partial responses, such as making a reference to the item without explanation. They received two points if they completely discussed the target item in their essay. For each activity there was also a list of target vocabulary words. The participants received one point for each word that was used in the essay answers. The rating scores were added up for each participant to result in a final score for the application exercise. There were twelve target items (0-2 points possible per each) in the first exercise and thirteen target vocabulary words (1 point possible per each) for a total of 37 possible points. There were twelve target items in the second exercise and thirteen target vocabulary words (37 total possible points). The scores for the activities were combined, so the minimum score was zero and the maximum possible score was 74. The results showed that the scores actually ranged from one to forty.

Application self-efficacy. Application self-efficacy was measured with a five-item scale modified from Brown (1999). The Brown (1999) scale had an internal consistency reliability of .73. The modified scale included items such as, "I am confident that I learned enough to improve the way I handle change events in my life." The items were rated on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). The alpha coefficient in this study for the five-item scale was .82.

Satisfaction with training. Training satisfaction was measured using an eight-item scale modified from the task satisfaction scale used in Williams (1997). The Williams (1997) scale has a coefficient alpha of .86. The modified scale included items such as, "I am glad I had a chance to take this course". The items were rated on a five-point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). The alpha coefficient for

the eight-item scale used in this study was .91.

Learner control condition. There were two randomly assigned experimental conditions of high and low learner control as described earlier. The high control condition was labeled as a one and the low control condition was labeled as a zero. There were 117 participants (49.6%) in the low control condition and 119 participants (50.4%) in the high control condition.

Time in course. Although not hypothesized, the total time in the course was also measured. The time was measured in minutes and ranged from 15 to 73 minutes.

RESULTS

Data Analysis Strategy

The first data analysis step in this study was to examine the robustness of the measures. This involved examining the unidimensionality of some of the scales using alpha reliability analyses, considering square root transformations and using factor analysis to consider the factor structure of two of the measures. The scales were modified to reflect suggested changes and inter-scale correlations were run. The hypotheses were tested using a series of hierarchical regressions. Finally, some post-hoc analyses of an alternative model were run.

Analysis of the Measures

Alpha reliabilities. Alpha reliabilities were run for the self-report scales including mastery orientation, performance orientation, self-efficacy, attitude to WBT, microcomputer playfulness, attentional focus, emotional engagement, application self-efficacy and satisfaction with training. Three scales, attitude to WBT, emotional engagement, and attentional focus, were modified as a result of the analysis. The details of the changes are reported in the Method section of this report. All of the resulting alpha reliabilities were acceptable and ranged from .74 to .91.

Factor analysis. When initial correlations were run between the scales, it was noted that there was a correlation between the two engagement choice measures (attentional focus and emotional engagement; $r = .47$). According to the theory, these two measures were intended to represent the choices made by the learner about how involved (level of attention and emotional involvement) to become with the training.

They were expected to be conceptually related, yet empirically distinct, variables. The high correlation indicated that a relationship did exist, but it was important to examine the factor structure of the variables to determine distinctness. Fifteen items were subjected to a common factor analysis. Nine items were from the emotional engagement scale (items 7 and 8 had already been removed due to the reliability analysis) and six items were from the attentional focus scale. An initial factor analysis was set to pull factors with eigenvalues greater than one and to rotate with Varimax rotation. The results of this initial analysis found three factors that explained 53% of the variance. Few items loaded on the third factor. The scree plot indicated that a two factor solution would be more appropriate.

Another factor analysis was run which specified two factors and Varimax rotation. The rotated factor matrix is shown in Table 2. The two factors accounted for 48% of the variance. The rotation converged in eight iterations. All of the emotional engagement items loaded on the first factor, except for item three, which loaded fairly evenly on both factors. Items two through five of the attentional focus scale loaded on the second factor. Items one and six of the attentional focus scale loaded fairly evenly on both factors.

These results seemed to suggest a two factor solution with factor one being emotional engagement and factor two being attentional focus. The three items that cross-loaded did not fit well with the other items in the respective scales from a conceptual and methodological perspective. Item three on the emotional engagement scale dealt with actively participating in the course as opposed to the emotional response to the training. The first and sixth items on the attentional focus scale were both reverse scored from the

other items, which might have contributed to the cross-loading. In addition, the first attentional focus question was poorly written due to being double-barreled. Consequently, the three items that cross-loaded were removed from their respective scales. The revised scales were still significantly correlated (r=.39), but the correlation was lower indicating more independence. Resulting reliabilities for the modified scales were reasonable and are reported in the Method section. These results suggested that the two scales were related but distinct constructs.

Table 2: Rotated Factor Matrix for Engagement Choice Items

	Factors	
Items	1	2
Emotional Engagement 1	.680	.008
Emotional Engagement 2 (R)	.716	.205
Emotional Engagement 3 *	.383	.381
Emotional Engagement 4	.742	.221
Emotional Engagement 5	.622	.190
Emotional Engagement 6	.885	.148
Emotional Engagement 9	.626	.008
Emotional Engagement 10	.495	.290
Emotional Engagement 11	.608	.218
Attentional Focus 1 *	.241	.234
Attentional Focus 2 (R)	.106	.777
Attentional Focus 3 (R)	.245	.573
Attentional Focus 4 (R)	.008	.732
Attentional Focus 5 (R)	.142	.889
Attentional Focus 6 *	.417	.531

(R) = Reverse Scored items; * Items dropped from final scales.

Descriptives. The descriptive statistics for the scales were examined in order to check the distributional properties of the variables. All of the self-report, psychological scales had descriptives within normal ranges. The time and count variables displayed much more variability with some extreme ranges. Time and count variables have the possibility of experiencing overdispersion, which occurs when the variances exceed the means (Long, 1997; Brown, 1999).

In order to approximate normal distribution, the variables were submitted to a square root transformation. The descriptives and correlations of the transformed variables were compared to the descriptives and correlations of the untransformed variables. The descriptives of the transformed variables accounted for some extreme values and more closely resembled normal distribution. However, the real test was to consider the effect of the transformed variables on relationships with the other variable in the study. The transformed and untransformed variables had slightly different correlations with the other variables. Some of the relationships were higher and some were lower. However, the correlations showed the same pattern of significant relationships for the transformed and untransformed variables. Interpreting transformed variables can be challenging, since the metrics do not reflect the original metrics for the variable. Based on the interpretational difficulty of transformed variables and the consistent pattern of significant relationships, it was decided to use the original, untransformed variables in the analysis for this study. All future references to the time and count variables are for the untransformed variables.

Correlations. Table 3 (see Appendix A) presents the descriptive statistics and correlations for the variables used in the study. Means and standard deviations for each scale are included in the first two columns. Alpha reliability coefficients are listed in parentheses in the diagonal when appropriate for the measure. The correlation matrix shows the relationships between all of the variables hypothesized in the study. In addition, statistics are included for performance orientation and total time spent in course, which were not formally hypothesized. Performance orientation was included as a counter-point measure to mastery orientation, but it was not significantly correlated to any of the variables in the study. Total time in the course was significantly and positively related to all of the process and outcome variables, except application self-efficacy (r=.08). It was logical that learners who made more of the behavioral learning choices would ultimately spend longer in the course, because each extra action takes time. The results also suggested that learners who engage more with the course spend longer in the course. Time in the course was related to outcomes such as post-test scores (r=.35), performance on the skill-based exercise (r=.27) and satisfaction (r=.19). The time the learner spent in the course related to many of the outcomes. This could reinforce the need to identify ways to promote engagement and interaction with the self-paced learning in order to keep the learner involved for longer.

Table 3: Means, Standard Deviations, Reliabilities and Intercorrelations of Scales

	Mean	SD	1	2	3	4	5	6	7	8	9
1. Mastery Orientation	4.02	.42	(.74)								
2. Performance Orientation	3.94	.52	.04	(.82)							
3. Self-efficacy	4.01	.63	.25**	.12	(.87)						
4. Attitude to WBT	3.51	.59	.05	.09	.33**	(.86)					
5. Microcomputer Playfulness	5.16	.73	.27**	.03	.40**	.25**	(.78)				
6. Learner Control Condition	.50	.50	.05	.02	.09	.02	.05	--			
7. Content Choice (count)	9.03	6.03	.07	-.07	-.10	-.08	-.18**	-.06	--		
8. Content Choice (time in secs)	141.14	118.53	.10	-.08	-.06	-.04	-.14*	-.06	.81**	--	
9. Content Choice (avg. time)	14.52	8.73	.11	-.09	-.02	.04	-.01	-.04	.19**	.65**	--
10. Activity Level	83.71	21.63	.04	-.04	-.06	.04	.02	.15*	.33**	.29**	.14*
11. Attentional Focus	2.99	.82	.11	-.03	.05	.08	.02	-.02	.13*	.16*	.14*
12. Emotional Engagement	2.74	.67	.09	.025	.10	.18**	.05	.07	.16*	.14*	.02
13. Pretest	5.54	1.90	.04	.03	.09	.044	.04	.14*	.00	.05	.08
14. Posttest	10.57	2.36	.09	-.03	-.02	.07	-.01	-.03	.28**	.39**	.34**
15. Skill-based Learning	21.67	6.86	.16*	-.07	.11	-.07	.02	.01	.14*	.23**	.21**
16. Application Self-Efficacy	3.22	.68	.22**	-.08	.19**	.15*	.13*	.07	.04	.09	.04
17. Satisfaction	3.34	.68	.09	-.01	.08	.20**	.05	.15*	.22**	.22**	.09
18. Total time in course (min)	41.75	11.67	.10	-.10	-.03	.05	-.02	-.05	.41**	.54**	.46**

First two columns present mean and standard deviation. ** indicates significant at $p < .01$ and * indicates significant at $p < .05$. Numbers in parentheses on the diagonal are alpha reliabilities. All scales in this table are final scales after described item changes were made.

Table 3 (cont'd)

	10	11	12	13	14	15	16	17	18
1. Mastery Orientation									
2. Performance Orientation									
3. Self-efficacy									
4. Attitude to WBT									
5. Microcomputer Playfulness									
6. Learner Control Condition									
7. Content Choice (count)									
8. Content Choice (time/ secs)									
9. Content Choice (avg. time)									
10. Activity Level	--								
11. Attentional Focus	.00	(.85)							
12. Emotional Engagement	.08	.39**	(.88)						
13. Pretest	.21**	.07	.09	--					
14. Posttest	.24**	.10*	.15*	.28**	--				
15. Skill-based Learning	.14*	.13*	.13*	.19**	.50**	--			
16. Application Self-Efficacy	-.03	.28**	.49**	.01	.18**	.10	(.82)		
17. Satisfaction	.10	.35**	.75**	.10	.27**	.19**	.62**	(.91)	
18. Total time in course (min)	.47**	.20**	.16*	.13*	.35**	.27**	.08	.19**	--

** indicates significant at $p < .01$ and * indicates significant at $p < .05$. Numbers in parentheses on the diagonal are alpha reliabilities.
All scales in this table are final scales after described item changes were made

Although conceptually distinct, some of the individual difference variables showed moderate correlations with each other. For example, microcomputer playfulness correlated with mastery orientation (r=.27), self-efficacy (r=.40) and attitude to WBT (r=.25). Self-efficacy also correlated with mastery orientation (r=.25) and attitude to WBT (r=.33). These correlations are not surprising considering that all of the individual differences have a motivational element in them.

With a few exceptions, the correlation matrix indicated that the individual difference variables were not related to the behavioral and engagement choices. Mastery orientation, self-efficacy and attitude to WBT were not significantly correlated with many of the process variables. Attitude to WBT was correlated with emotional engagement (r=.18). This suggested that learners who had a positive attitude to the training medium became more emotionally involved with the training. Contrary to expectations, microcomputer playfulness had a negative relationship with the two measures of content choice (r=-.18 for count measure) and (r=-.13 for time measure). This indicated that learners who expressed an interest in playing or exploring with the computer actually made fewer of the valuable content choices and spent less time viewing them. One possibility was that those learners were spending time exploring other pages, but that does not appear the case. There was not a significant relationship between microcomputer playfulness and overall activity level (r=.02). Some of the individual difference variables were also correlated with outcome variables, especially application self-efficacy.

The learner control manipulation did not seem to have much of an effect on the participants. Learner control only had a relationship with one of the predicted variables.

People in the higher learner control condition had a higher activity level (r=.15). There was a significant relationship between learner control version and the pretest score (r=.14), but that was probably due to an experimental artifact. Learners were informed of their level of control immediately before completing the pretest. Learners in the low control condition scored lower on the pretest, perhaps due to the negative information of being in the low control condition. However, the version effect seemed to mostly disappear after that initial effect. People in the higher control condition were also more satisfied with the course (r=.15).

The correlation matrix indicated that there were more significant relationships in the second part of the model than in the first part. Many of the process variables correlated with each other. For example, the content choice count variable correlated with the other behavioral choice measure, activity level (r=.33) but also with attentional focus (r=.13) and emotional engagement (r=.16). The final scales for attentional focus and emotional engagement were correlated (r=.39), but were demonstrated to be separate constructs in the factor analysis described earlier.

The three versions of content choice were examined to determine which measure(s) should be used in further analyses. The average time content choice measure was more strongly correlated with the other time measure of content choice (r=.65, $p<.01$) than with the count measure (r=.19, $p<.01$). Further examination showed that the average time measure of content choice had patterns of correlations similar to that of the time measure, but fewer of the relationships were significant. Due to the weaker showing of the average time measure, it was not included in the analyses of the hypotheses. Not surprisingly, the count and time measures of content choice had a high zero-order

correlation (r=.81, p<.01). They showed similar patterns of correlations with the other variables, so the two measures seemed redundant. Due to the high correlation and similarity in relationships, the count measure of content choice seemed adequate to represent the variable. The count measure of content choice was used in the hypothesis testing.

All of the predicted relationships between the process variables and the outcome variables were significant, except that attentional focus was not significantly correlated with the posttest (r=.10). These results were promising for the second half of the model. Choices that learner made in the training did seem to be positively related to training outcomes. Attentional focus was correlated with satisfaction (r=.35) as predicted and also showed unexpected relationships with application self-efficacy (r=.28), skill-based learning (r=.13) and time in the course (r=.20). This indicated that learners who paid attention to the material enjoyed the course more, had more confidence about applying the information, were able to apply the information in an essay format and spent longer in the course. Emotional engagement showed a correlation with satisfaction (r=.75). Some of the strength of the correlation could be due to a similarity in the constructs, but they did have conceptual differences. The emotional engagement variable was a process variable collected in the middle of the training that captured the learner's immediate state and feelings at the time. Satisfaction was an outcome variable collected at the end of training that measured the learner's overall reaction to the course. Emotional engagement also showed marginal relationships with the posttest (r=.15), skill-based learning (r=.13) and time in the course (r=.16). As expected, emotional engagement also showed a positive, significant correlation with application self-efficacy (r=.49). Learners

who were emotionally engaged with the course seemed to enjoy the course more and have more confidence in their ability to use the information in the future.

The content choice (count) variable showed the expected correlation with the posttest (r=.28) and a marginal relationship with skill-based learning (r=.14). Learners who made more of the targeted learning choices did better on the posttest and the final essays. Unpredicted correlations also occurred between content choice and satisfaction (r=.22) and time in the course (r=.41). Activity level showed an expected relationship with the posttest (r=.24) and a marginal one with skill-based learning (r=.14). It indicated that learners who did more during the training (accessed more pages) performed better on the posttest and the final essays. Activity level was also strongly related to time in the course (r=.47). These relationships were further explored through regression analyses based on the hypotheses.

Hypothesis Testing. The hypotheses were tested using a series of regressions. The results showed almost no support for the hypotheses linking the individual difference variables and the process (behavioral choices and engagement choices) variables. As a whole, mastery orientation, self-efficacy, attitude toward WBT and microcomputer playfulness did not seem to influence choices made during the training. The relationships between behavior and engagement choices and the outcome variables were more promising. Some of the hypotheses were supported, suggesting that what the learner did during the training did affect declarative knowledge, skill-based learning, application self-efficacy and satisfaction.

Relationship between Individual Differences and Process Variables

The effect of the individual difference variables on the learning choices was assessed through a series of regression analyses. For most of the analyses, a process variable was the dependent variable and the other variables were entered in three steps. The first step entered the four individual difference variables. The second step entered the learner control variable and the third step entered the four possible interaction variables.

H1, H2, H3, and H4 predicted that participants with high mastery orientation, Web self-efficacy, attitude toward WBT, and microcomputer playfulness would make more of the targeted content choices, have a higher activity level, have more attentional focus and have more emotional engagement than participants low in the individual differences. H5 and H6 predicted moderation effects of individual difference variables and the learner control condition on behavioral choices and engagement choices, respectively. As explained below, none of the interactions were significant, so none of them were graphed.

Content Choice. Table 4 tested the effect of the four individual differences and the moderators on content choice. Table 4 showed that the four individual difference variables explained 5% of the variance in content choice (count) while the entire analysis accounted for a total of 7% of the variance. Most of the variance was explained by microcomputer playfulness ($\beta = -.19$; $p<.01$) with some explained by mastery orientation ($\beta = .13$; $p<.10$) which was marginally significant. The negative relationship of microcomputer playfulness and content choice was significant but was actually opposite the hypothesized positive relationship. This finding for microcomputer playfulness

suggested that learners who considered themselves exploratory and imaginative computer users chose fewer of the valuable learning activities. None of the other individual difference variables had significant relationships with content choice.

The results in Table 4 did not strongly support the hypotheses. No support was found for the content choice elements of H2 (self-efficacy) or H3 (attitude to WBT). The finding regarding microcomputer playfulness was actually counter to H4, which predicted that learners with high microcomputer playfulness scores would make more of the targeted content choices. Marginal support was found for H1 for the relationship between mastery orientation and content choice. Learners with high mastery orientations made more of the targeted learning choices. As seen in Table 4, the learner control condition did not have a significant effect on content choices. However, the moderator analysis showed marginal support for an interaction between the control condition and self-efficacy.

Table 4: Regression Results of Content Choices (count)

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Mastery Orientation	.13[a]	.05*	--	4, 231
	Web Self-efficacy	-.06			
	Attitude toward WBT	-.02			
	Microcomputer Playfulness	-.19**			
2	Learner Control Condition	-.05	.05	.00	5, 230
3	Condition*mastery	.68	.07	.02	9, 226
	Condition*self-efficacy	-.85[a]			
	Condition*attitude	.39			
	Condition*playfulness	.13			

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

The marginally significant interaction between learner control condition and self-efficacy was not strong enough to be a reliable result, especially since learner control was not significant in the previous step. These results showed no support for the content choice

element of H5 and H6, which predicted the moderation relationships.

Activity Level. Further analysis of H1 through H6 also showed disappointing results for the influence of the individual difference variables on activity level. Table 5 shows the regression, which indicated that all of the variables only accounted for 5% of the variance. None of the four individual differences had a significant relationship with activity level. This suggested that learners were not influenced in how much to do in the course by mastery orientation, self-efficacy, attitude toward WBT or microcomputer playfulness. The second step of the regression did show a significant relationship for the learner control condition ($\beta = .15$; $p<.05$). This indicated that learners in the high control condition had higher activity levels than learners in the low control condition. None of the interaction variables were significant in the regression. No support was found for Hypotheses 1-6 in relation to activity level as a dependent variable.

Table 5: Regression Results of Activity Level

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Mastery Orientation	.06	.01	--	4, 231
	Web Self-efficacy	-.11			
	Attitude toward WBT	.06			
	Microcomputer Playfulness	.04			
2	Learner Control Condition	.15*	.04	.03*	5, 230
3	Condition*mastery	.96	.05	.01	9, 226
	Condition*self-efficacy	-.51			
	Condition*attitude	-.10			
	Condition*playfulness	-.32			

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

Attentional Focus. As with activity level, analysis of H1-H6 for attentional focus did not demonstrate any significant relationships as seen in Table 6. Collectively, the variables accounted for only 4% of the variance in attentional focus. These results suggested that choices about how hard to focus or concentrate on the course were not

influenced by the measured individual differences. The amount of learner control and interactions were also not significantly related to attentional focus.

Table 6: Regression Results of Attentional Focus

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Mastery Orientation	.11	.02	--	4, 231
	Web Self-efficacy	.01			
	Attitude toward WBT	.08			
	Microcomputer Playfulness	-.03			
2	Learner Control Condition	-.02	.02	.00	5, 230
3	Condition*mastery	-.59	.04	.02	9, 226
	Condition*self-efficacy	-.89			
	Condition*attitude	.28			
	Condition*playfulness	.16			

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

Emotional Engagement. For emotional engagement, the variables accounted for 6% of the variance as seen in Table 7. The only significant relationship was for attitude toward WBT ($\beta = .18$; $p<.01$). This suggested that learners who had a positive attitude to WBT became more emotionally involved with the course. This supported the emotional engagement aspect of H3.

Table 7: Regression Results of Emotional Engagement

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Mastery Orientation	.08	.04*	--	4, 231
	Web Self-efficacy	.03			
	Attitude toward WBT	.18**			
	Microcomputer Playfulness	-.03			
2	Learner Control Condition	.07	.05	.005	5, 230
3	Condition*mastery	-.39	.06	.012	9, 226
	Condition*self-efficacy	-.64			
	Condition*attitude	.13			
	Condition*playfulness	.72			

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

Summary. As summarized in Table 14, the data did not support most of the hypothesized relationships between the individual difference variables and the process variables. Mastery orientation was related to content choice in partial support of H1, but none of the other relationships in H1 were significant. Web self-efficacy did not relate to any of the process variables, so no support was found for H2. Partial support was found for H3 due to a positive, significant relationship between attitude toward WBT and emotional engagement. Microcomputer playfulness showed a significant, relationship with content choice, but that was opposite the hypothesized relationship. None of the other relationships in H4 were significant, so it was not supported as written. H5 and H6 hypothesized moderation from the learner control condition between the individual differences and the process variables. However, the learner control variable did not have many significant zero-order correlations and only had a significant relationship with activity level in the regression analyses. The learner control manipulation was not a strong influence in the study. No support was found for learner control condition as a moderator, so no support was found for H5 and H6.

Relationship between Process Variables and Outcomes

H7 through H10 dealt with the relationships between behavioral and engagement choices and the training outcomes of declarative knowledge, skill-based learning, application self-efficacy and satisfaction with training. These hypotheses were tested using hierarchical regression. The four individual difference variables were entered in the first step, before entering the hypothesized variables. This provided a control for individual differences, before considering the process/ outcome relationship.

Satisfaction with training. H7 predicted that the engagement choices of attentional focus and emotional engagement would relate to satisfaction with training. The results of the analysis are seen in Table 8. The six variables (including individual differences) accounted for 57% of the variance in satisfaction with training. Although not hypothesized, some of the variance was explained by a direct relationship between attitude toward WBT and satisfaction ($\beta = .20$; $p<.01$). However, the overwhelming majority of the variance in satisfaction was explained by emotional engagement ($\beta = .71$; $p<.01$). This suggested that people who were more emotionally involved during the course were more pleased with the course overall.

The initial zero-order correlations showed a significant correlation between attentional focus and satisfaction ($r=.35$, $p<.01$). However, the regression in Table 8 did not show a significant relationship for attentional focus, probably due to the strength of the emotional engagement variable. To explore the effect of attentional focus, another regression was done as seen in Table 9. In this analysis, attentional focus was added into the regression a step before emotional engagement. The analysis in Table 9 demonstrated that attentional focus was significantly related to satisfaction ($\beta = .33$; $p<.01$), when the variance was not first accounted for by the emotional engagement variable. This indicated that learners who concentrated more during the training were more pleased with the training. These results supported H7 and also highlighted an unhypothesized relationship between attitude toward WBT and satisfaction with training.

Table 8: Regression Results of Satisfaction with Training

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Mastery Orientation	.09	.05*	--	4, 231
	Web Self-efficacy	.03			
	Attitude toward WBT	.20**			
	Microcomputer Playfulness	-.03			
2	Emotional Engagement	.71**	.57**	.52	6,229
	Attentional Focus	.07			

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

Table 9: Alternative Regression Results of Satisfaction with Training

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Mastery Orientation	.09	.05*	--	4, 231
	Web Self-efficacy	.03			
	Attitude toward WBT	.20**			
	Microcomputer Playfulness	-.03			
2	Attentional Focus	.33**	.16**	.11**	5,230
3	Emotional Engagement	.71**	.57**	.41**	6,229

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

Application self-efficacy. H8 predicted that emotional engagement would relate to application self-efficacy. Table 10 showed the results of this analysis. Step 1 showed an unhypothesized direct relationship between mastery orientation and application self-efficacy ($\beta = .18$; $p<.01$). This indicated that learners with an exploratory learning style were more likely to feel confident about their ability to apply the information learned in the course. The initial zero-order correlations showed correlations between application self-efficacy and the other individual difference variables as well: self-efficacy ($r=.19$; $p<.01$), attitude ($r=.15$; $p<.05$) and microcomputer playfulness ($r=.13$; $p<.05$). However, these relationships did not remain significant when entered as a block into the regression analysis.

The individual difference variables and emotional engagement accounted for 28%

of the variance in application self-efficacy. As hypothesized in H8, emotional engagement was related to application self-efficacy (β = .46; p<.01). Learners who were emotionally involved in the course had more confidence in their ability to apply the information.

Table 10: Regression Results of Application Self-efficacy

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Mastery Orientation	.18**	.08**	--	4, 231
	Web Self-efficacy	.11			
	Attitude toward WBT	.11			
	Microcomputer Playfulness	.01			
2	Emotional Engagement	.46**	.28**	.20**	5,230

** indicates significant at p < .01; * indicates significant at p < .05; [a] indicates significant at p < .10

Declarative Knowledge. H9 predicted that the four process variables would relate to declarative knowledge. The dependent variable for this analysis was the posttest score, so the pretest score was entered in the first step as a control variable. Results indicate that the variables account for 19% of the variance in declarative knowledge, but only 11% of the variance after the pretest is factored out as seen in Table 11. Some of the variance is explained by the pretest control variable (β = .28; p<.01). The individual difference variables were not significantly related to declarative knowledge. Only one of the four process variables was related to declarative knowledge, providing partial support for H9. Content choice was related to declarative knowledge (β = .24; p<.01). This suggested that learners who chose the targeted learning items performed better on the posttest. This was a logical conclusion, since one criteria for an item to be a targeted learning item was that it related to the material on the pre and posttests.

Table 11: Regression Results of Declarative knowledge

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Pretest score	.28	.08**	--	1,234
2	Mastery Orientation	.11	.10	.02	5,230
	Web Self-efficacy	-.08			
	Attitude toward WBT	.09			
	Microcomputer Playfulness	-.04			
3	Attentional Focus	.02	.19**	.09**	9,226
	Activity Level	.09			
	Content Choice (count)	.24**			
	Emotional Engagement	.06			

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

Skill-based learning. H10 predicted that the behavioral choice variables (content choice and activity level) would be related to skill-based learning. This hypothesis was only marginally, partially supported in the analysis using the count measure of content choice as seen in Table 12. The first two steps of the analysis with six variables only predicted 7% of the variance in skill-based learning. Step 1 showed a direct relationship with mastery orientation ($\beta = .14$; $p<.05$) and a marginal direct relationship with Web self-efficacy ($\beta = .12$; $p<.10$), neither of which was hypothesized. The hypothesized relationship shown in Step 2 showed a marginal relationship between activity level and skill-based learning ($\beta = .12$; $p<.10$). This indicated that learners who accessed more pages did better on the essay exercises. Content choice (hypothesized) and the engagement choice variables (Step 3, not hypothesized) were not significantly related to skill-based learning in the analysis. The results indicated marginal, partial support for H10 for activity level but no support for content choice.

Table 12: Regression Results of Skill-based Learning

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Mastery Orientation	.14*	.04*	--	4, 231
	Web Self-efficacy	.12[a]			
	Attitude toward WBT	-.11			
	Microcomputer Playfulness	-.04			
2	Activity Level	.12[a]	.07*	.03*	6,229
	Content Choice (count)	.10			
3	Attentional Focus	.08	.09	.02	8,227
	Emotional Engagement	.08			

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

Mediation. Although not specifically hypothesized, the model indicated that individual difference variables would be mediated through the process variables to affect the outcome variables. For mediation to occur, the variables must meet certain criteria (James & Brett, 1984). Due to the poor performance of the model in this study, many of these requirements were not met which indicated that mediation was not occurring.

One requirement is that the input variables must be related to the mediating variable. The analyses only showed three relationships that met this requirement (mastery orientation and content choice: Table 4; microcomputer playfulness and content choice: Table 4; attitude toward WBT and emotional engagement: Table 7). The second requirement is that the mediating variable must be related to the outcome variable. Many more of the variables fit this criteria, but only three relationships involved the variables that also met the first requirement (content choice and declarative knowledge: Table 11; content choice and satisfaction: Table 9; emotional engagement and satisfaction: Table 9). The third requirement is that the input variables must be related to the outcome variables. Only one relationship that met the previous two requirements also met this requirement (attitude toward WBT and satisfaction). The one path of mediation that

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withstood the first three requirements (attitude to emotional engagement to satisfaction) was analyzed in a mediation test as shown in Table 13. The fourth requirement was that the input variable (attitude toward WBT) would not be significantly related to satisfaction if the mediating variable (emotional engagement) was partialled out of the analysis. The model that was tested was that attitude predicted emotional engagement, which predicted satisfaction, and attitude only affected satisfaction through emotional engagement. Table 13 showed that the fourth requirement was fulfilled, indicating that attitude was fully mediated through emotional engagement to have a relationship with satisfaction.

Table 13: Mediation Analysis of Satisfaction

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Emotional engagement	.75**	.56**	--	1, 234
2	Attitude	.06	.56**	.00	2, 233

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

Summary. Table 14 gives a summary of the results found for the regression analyses of the hypotheses. When applicable, the hypotheses were broken down into the different dependent variables. The column labeled "Support?" indicated whether the relationship was significant (Yes) at $p<.01$ or $p<.05$ or non-significant (No). Partial support indicated that the relationship held for one, but not all of the relationships included in the hypothesis. Marginal support indicated a significant relationship at the $p<.10$ level. As the table clearly demonstrates, most of the hypotheses were not significant. The research model did not perform well in the analysis.

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Table 14: Summary of Results

Hyp.	Dependent Variable	Independent Variables	Support?
1	Content Choice	Mastery Orientation	**Yes**
1	Activity Level	Mastery Orientation	No
1	Attentional Focus	Mastery Orientation	No
1	Emotional Engagement	Mastery Orientation	No
2	Content Choice	Web Self-efficacy	No
2	Activity Level	Web Self-efficacy	No
2	Attentional Focus	Web Self-efficacy	No
2	Emotional Engagement	Web Self-efficacy	No
3	Content Choice	Attitude toward WBT	No
3	Activity Level	Attitude toward WBT	No
3	Attentional Focus	Attitude toward WBT	No
3	Emotional Engagement	Attitude toward WBT	**Yes**
4	Content Choice	Microcomputer Playfulness	No (opposite significant rel.)
4	Activity Level	Microcomputer Playfulness	No
4	Attentional Focus	Microcomputer Playfulness	No
4	Emotional Engagement	Microcomputer Playfulness	No
5	Behavioral Choices	Individual Differences and Interactions with learner control condition	No
6	Engagement Choices	Individual Differences and Interactions with learner control condition	No
7	Satisfaction	Attentional Focus Emotional Engagement	**Yes**
8	Application Self-efficacy	Emotional Engagement	**Yes**
9	Declarative Knowledge	Content Choices Activity Level Attentional Focus Emotional Engagement	Partial (Content Choice)
10	Skill-based Learning	Content Choices Activity Level	Partial (marginal - activity level)

Post hoc Analysis

The results of the hypothesis testing were disappointing, and the research model did not perform well. Even so, the correlation table indicated that there were some relationships between the variables, even if they were not originally hypothesized. In order to explore these relationships further, some post hoc analyses were conducted. These analyses were intended to seek alternative relationships and models in the hope of gaining some understanding of what occurred. This type of post hoc analysis could provide valuable information about future directions for research. Two additional regression analyses were run that followed the basic framework of the model. In addition, some new models were developed and tested, based on a logical assessment of possible relationships. It was possible that the data could tell a story framed by an alternative model. One model with satisfaction as a mediator to the other outcome variables showed promise in the post hoc analyses.

Additional process variables and outcomes. The zero-order correlations indicated that relationships were occurring between some of the process and outcome variables. In one case, content choice was significantly correlated with satisfaction with training ($r=.22$). An additional regression analysis (Table 15) was run that entered the two behavioral choice variables and time in the course as a final step. The final step indicated that content choice predicted satisfaction ($\beta = .10$; $p<.05$), even beyond the variance claimed by the emotional engagement variable. This suggested that people who chose more of the targeted learning items were more pleased with the course. With the additional variables, 58% of the variance in satisfaction was explained as compared to 57% without the final step. This was not a large gain in explained variance. Although

the beta of content choice was significant, the R^2 change was not significant. This indicated that content choice did not contribute much to the explanation of variance in satisfaction.

Table 15: Additional Regression Results of Satisfaction with Training

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Mastery Orientation	.09	.05*	--	4, 231
	Web Self-efficacy	.03			
	Attitude toward WBT	.20**			
	Microcomputer Playfulness	-.03			
2	Attentional Focus	.33**	.16**	.11**	5,230
3	Emotional Engagement	.71**	.57**	.41**	6,229
4	Activity Level	-.02	.58	.01	9,226
	Content Choice (count)	.10*			
	Total time in course	.03			

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

A similar analysis was run for application self-efficacy as seen in Table 16. An initial zero-order correlation between attentional focus and application self-efficacy ($r=.28$; $p<.01$) did not remain significant in the regression analysis in Step 3.

Table 16: Additional Regression Results of Application Self-efficacy

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Mastery Orientation	.18**	.08**	--	4, 231
	Web Self-efficacy	.11			
	Attitude toward WBT	.11			
	Microcomputer Playfulness	.01			
2	Emotional Engagement	.46**	.28**	.20**	5,230
3	Attentional Focus	.08	.29	.01	9,226
	Activity Level	-.07			
	Content Choice (count)	-.01			
	Total time in course	.02			

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

These results suggested that content choice was related to satisfaction, but the non-significant R^2 change made the interpretation ambiguous. This relationship should be investigated further in future research. These two post hoc analyses did not provide much insight into the nature of the data and relationships. Since analyses based on the original model were not providing good results, additional models were considered. These post hoc models were constructed from existing variables, but were based on reasonable, theoretically consistent ideas.

Alternative Model #1. Considering the constructs, it seemed possible that the variables could be re-organized into an alternative model. A model was conceptualized and tested that indicated that engagement choices could relate to behavioral choices which would in turn mediate the relationship to the final outcomes. The logic was that learners made their emotional engagement choices in terms of their amount of focus and emotional involvement. This level of focus and involvement would dictate the overall amount of activity and the tendency to choose targeted learning items. Learners who were more focused and engaged would do more and make more of the targeted choices. Amount of activity and targeted choices would affect final learning outcomes. This model was tested as seen in Tables 17 and 18. The model as a whole did not show support. For the most part, the engagement variables did not relate to the behavioral choice variables, even without the individual difference variables included. In Table 17, neither emotional engagement nor attentional focus was related to activity level. In Table 18, attentional focus was not related to content choice either. However, emotional engagement showed a marginally significant relationship to content choice. Even with this marginally significant relationship, only 3% of the variance was explained.

Table 17: Post hoc Regression Results of Activity Level

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Emotional Engagement	.10	.01	--	2,233
	Attentional Focus	-.04			

** indicates significant at p < .01; * indicates significant at p < .05; [a] indicates significant at p < .10

Table 18: Post hoc Regression Results of Content Choice (count)

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Emotional Engagement	.13[a]	.03*	--	2,233
	Attentional Focus	.08			

** indicates significant at p < .01; * indicates significant at p < .05; [a] indicates significant at p < .10

The variables that did not perform well in Tables 17 and 18 were dropped from further analysis, so the focus was on emotional engagement and content choice. Reviewing earlier analyses, satisfaction was the only final outcome variable that was related to both emotional engagement and content choice. A mediation analysis was run to consider the relationship between emotional engagement and content choice, with content choice mediating the relationship to satisfaction. The results did not strongly support a mediated model. Emotional engagement was only marginally related to content choice (as seen in Table 18). The results in Table 19 indicated that emotional engagement had a strong direct relationship with satisfaction even when content choice was partialled out. These findings did not support a mediated model.

Table 19: Post hoc Mediation Results of Satisfaction

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Content Choice	.22**	.05**	--	1,234
2	Emotional Engagement	.73**	.57**	.52**	2,233

** indicates significant at p < .01; * indicates significant at p < .05; [a] indicates significant at p < .10

Alternative Model #2. Considering the significant correlations between the process and outcome variables, it seemed possible that something additional was occurring. Many of the variables had significant relationships with satisfaction, including the other final outcome variables. One possibility was that satisfaction had a role as a mediator to the other outcome variables instead of being a final outcome itself. Earlier analyses (Table 15) showed that attentional focus, emotional engagement and content choice were all related to satisfaction. Attitude to WBT also had a direct relationship with satisfaction. Since satisfaction had many strong relationships, it was chosen for the focus as a mediator in this analysis. Building on these finding, several additional analyses were run to test satisfaction as a mediator between the process variables and the final outcomes.

The analysis in Table 20 examined the relationship of satisfaction to application self-efficacy, after controlling for the process variables. The results indicated that satisfaction was significantly related to application self-efficacy, and the five variables explained 40% of the variance in application self-efficacy. Learners who were more satisfied with the course had more confidence in their ability to apply the information after training. Table 20 also shows a relationship between emotional engagement and application self-efficacy. It appeared that learners who were more emotionally involved with the course also had higher application confidence. To test this relationship further, the analysis in Table 21 entered the process variables after satisfaction. The results showed that emotional engagement was no longer significantly related to application self-efficacy when satisfaction was partialled out of the equation. This indicated that the relationship between emotional engagement and application self-efficacy was fully

mediated through satisfaction. None of the other process variables showed significant relationships.

Table 20: Post hoc Regression Results of Application Self-efficacy

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Activity level	-.06	.25**	--	4,231
	Content Choice	-.02			
	Emotional Engagement	.46**			
	Attentional Focus	.10			
2	Satisfaction with Training	.59**	.40**	.15**	5,230

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

Table 21: Post hoc Mediation Results of Application Self-efficacy

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Satisfaction with Training	.62**	.38**	--	4,231
2	Activity level	-.06	.40**	.02	5,230
	Content Choice	-.08			
	Emotional Engagement	.04			
	Attentional Focus	.06			

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

Similar analyses were run for skill-based learning. As seen in Table 23, satisfaction had a marginally significant relationship with skill-based learning, when the process variables are controlled. The five variables accounted for 6% of the variance in skill-based learning. None of the process variables showed a relationship with skill-based learning. An earlier analysis (see Table 12) found a marginal relationship between activity level and skill-based learning. This marginal relationship did not stay significant when all of the process variables were entered into the analysis in one block. When satisfaction was entered into a regression in Step 1 without controlling for the process variable, it showed a stronger relationship to skill-based learning ($\beta = .09$, $p<.01$) and explained 4% of the variance.

Table 22: Post hoc Regression Results of Skill-based Learning

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Activity level	.11	.05*	--	4,231
	Content Choice	.08			
	Emotional Engagement	.08			
	Attentional Focus	.09			
2	Satisfaction with Training	.17[a]	.06[a]	.01[a]	5,230

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

Similar analyses for declarative knowledge indicated that satisfaction is significantly related to declarative knowledge. For these analyses, the pretest was entered in Step 1 as a control. Table 23 shows that satisfaction, content choice and the pretest were significantly related to declarative knowledge. Satisfaction and making targeted learning choices affected performance on the posttest. The six variables account for 21% of the variance in declarative knowledge (12% without pretest variance). The relationship between content choice and declarative knowledge was further explored in Table 24. Results indicated that content choice was still significantly related to declarative knowledge, even after controlling for satisfaction. This indicated that content choice has a direct relationship to declarative knowledge and a partially mediated relationship to it through satisfaction.

Table 23: Post hoc Regression Results of Declarative Knowledge - 1

Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Pretest	.28**	.08**	--	1,235
2	Activity level	.10	.18**	.10**	5,230
	Content Choice	.23**			
	Emotional Engagement	.07			
	Attentional Focus	.03			
3	Satisfaction with Training	.29**	.21**	.03**	6,229

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

Table 24: Post hoc Regression Results of Declarative Knowledge - 2

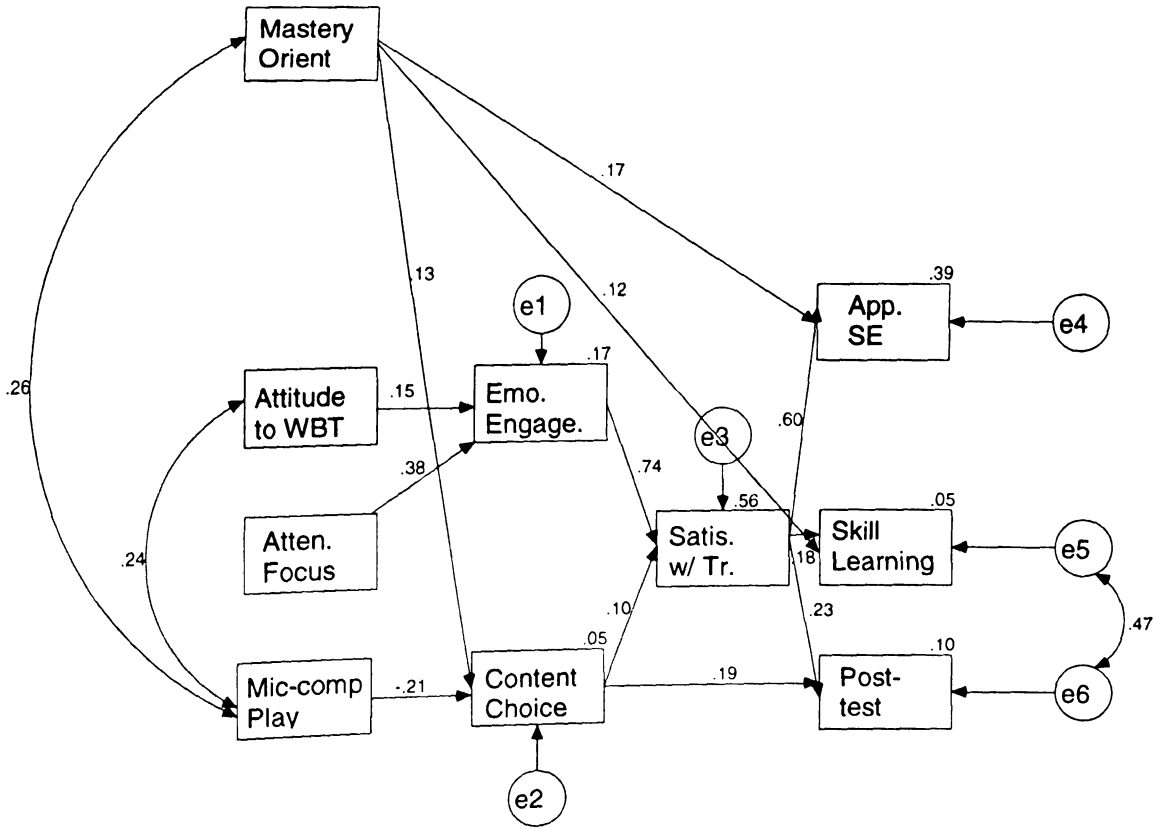
Step	Variable(s)	β at step	R^2	ΔR^2	df
1	Pretest	.28**	.08**	--	1,235
2	Satisfaction with Training	.25**	.14**	.06**	2,234
3	Activity level	.11	.21**	.07**	6,229
	Content Choice	.21**			
	Emotional Engagement	-.14			
	Attentional Focus	.01			

** indicates significant at $p < .01$; * indicates significant at $p < .05$; [a] indicates significant at $p < .10$

Model Fit. The results of the different regression analyses indicated several significant relationships. Overall model fit for the significant relationships was tested using structural equations modeling (AMOS program). Several modifications were made to the model based on feedback from initial analysis runs. One of the best fit models was represented in Figure 5. The included values are standardized beta weights and correlations. The results indicated good fit for the model. The model had a Chi Square value of 39.16 (P=.12) with 30 degrees of freedom. The CFI was .98, the GFI was .97, the AGFI was .94 and the RMSEA was .03. The data did support the model.

Summary. The resulting post hoc model indicated the importance of satisfaction in meditating the relationship between the process variables and the final outcome variables. Activity level showed no significant relationships and was not included in the model. Emotional engagement had a direct relationship with satisfaction and a relationship with application self-efficacy that was fully mediated through satisfaction. Attentional focus related to satisfaction, but not directly to the final outcomes. Content choice related to satisfaction and also had a direct relationship to declarative knowledge. The three process variables predicted 58% of the variance in satisfaction. Satisfaction in

turn had significant relationships with application self-efficacy, skill-based learning and declarative knowledge. Mastery orientation showed some direct relationships to content choice, application self-efficacy and skill-based learning. Attitude toward WBT was related to emotional engagement and microcomputer playfulness was related to content choice. The key point of interest in this model was the importance of satisfaction as an intermediary between the process variables and the final outcomes.



Values in the figure are standardized beta weights and correlations.

Figure 5. Post Hoc Model

DISCUSSION

This study was designed to consider the effects of individual differences and learner control on choices made by learners during a Web-based training session. The behavioral and engagement choices made by the learners were expected to influence final training outcomes. The research model presented in Figure 2 hypothesized relationships moderated by learner control between four individual differences (mastery orientation, Web self-efficacy, attitude toward Web-based training, microcomputer playfulness) and behavioral and engagement choices of the learners during training. Behavioral choices included activity level and content choice, while engagement choices included attentional focus and emotional engagement. These choices were expected to relate to the final outcomes of declarative knowledge, skill-based learning, application self-efficacy and satisfaction.

This model had a motivational framework based on the theories of cognitive choice and intrinsic motivation. Motivational concepts tied to many of the variables in the study. For example, the content choice variable represented the direction element of motivation, because it measured what the participants did in the training. Content choice also translated to the 'choice to initiate effort', which was a component of the cognitive choice theory (Campbell & Pritchard, 1976). Activity level and attentional focus represented the intensity element of motivation, since they measured how hard the participants worked. In the cognitive choice theory, activity level could represent the 'choice to persist', and attentional focus could represent 'choice to expend a certain amount of effort'. Intrinsic motivation provided insight into the concepts of learner

control and engagement. Engagement was intended to capture focus and feelings in the training, which related to intrinsic motivation concepts such as Csikszentmihayli's (1975) theory of Flow. Additional research (Nix, Ryan, Manly, Deci, 1999) indicated that control over behavior led to contentment and energy, suggesting the importance of learner control for training. The motivational theories provided a foundation for the model. The cognitive choice theories highlighted the importance of expectancy and values on decision making in training. The intrinsic motivation theories highlighted the importance of considering "why" the person was motivated.

Regardless of the theoretical foundation of the model, the results did not indicate a high level of support for the model. The individual difference variables did not display many of the hypothesized relationships. Mastery orientation and microcomputer playfulness were significantly related to content choice, although the microcomputer playfulness relationship was opposite from the hypothesized relationship. Another significant relationship occurred between attitude toward WBT and emotional engagement. The learner control manipulation for the study did not significantly relate to any of the variables or act as a moderator as hypothesized. More promise was seen in the second half of the model in the relationships between the process variables and the outcomes. As hypothesized, the engagement variables, attentional focus and emotional engagement, were both related to satisfaction. For the behavioral variables, content choice was related to declarative knowledge and activity level was related to skill-based learning. These significant findings suggested that there is value in using a process model to study training.

The findings of the study are described in more detail in the following sections,

which are broken down by discussions of learner control, engagement choices, and behavioral choices. The primary discussion is followed by an exploration of the post-hoc analyses, the problems with the individual difference variables, limitations and future research opportunities.

Learner Control

The experimental manipulation varied the level of control given to two groups of participants. One group had a high-level of control over the order and content of the training, and the other group had less control. It was expected that participants would make different behavioral and engagement choices during training based on the individual differences and level of control. Control was hypothesized to moderate the relationship between the individual difference variables and the choices. Hypothesis (H) 5 predicted that more behavioral choices (content choice and activity level) would be made by participants with low scores on the individual differences in the low control condition as compared to the high control condition. H5 predicted no difference across conditions for people with high scores on the individual difference variables. H6 predicted that participants with high individual difference scores would show higher engagement scores (attentional focus and emotional engagement) in the high control condition than in the low control condition. No difference across conditions was predicted for participants with low individual difference scores.

The results did not show any support for H5 or H6. Learner control was not a significant variable in any of the analyses, and none of the interaction variables were significant for any of the predicted relationships. The learner control manipulation did not have much of an effect on any of the variables, even most of the zero-order correlations were not significant. Learner control showed small correlations which were

significant at $p<.05$ level with activity level ($r=.15$), the pretest ($r=.14$) and satisfaction ($r=.15$). These initial correlations suggested that participants in the higher control condition accessed more pages, did better on the pretest and were more satisfied with the course. These results, especially the significant correlation with the pretest score, suggested that experimental artifacts from the design might have influenced results. In an attempt to strengthen the effect of the manipulation, participants were clearly told that there were two manipulations of control and which manipulation they had. This information was given to the participants immediately before taking the pretest. Learning that they were in the low control condition might have caused some of the participants to put less effort into the pretest and perform more poorly. This influence seemed to disappear by the posttest, since the posttest was not significantly correlated with the learner control condition. This finding caused some suspicion about the other two correlations as well. They might have been legitimate correlations, or they might have been caused by motivational differences as participants were intentionally told they have less or more control. In any case, the correlations did not lead to significant relationships in the regression analyses.

Unfortunately, these results contributed some additional confusion to the complicated learner control findings. Learner control studies have differed on methodology and findings. Kinzie, Sullivan and Berdal (1988) found that learner control had a positive impact, since students with more control (learner control) performed better than students with less control (program control). However, they used a different design that focused on learner control of exercise feedback, as opposed to the design in this study which focused on control over pace, sequence and content. The methodological

differences make it difficult to compare studies, but initial comparisons indicate differences in findings. In contrast to Kinzie et al. (1988), Lee and Lee (1991) found mixed results. They found that the influence of the different types of control differed for different types of outcomes. Specifically, program control was more effective for knowledge acquisition, and learner control was more effective for knowledge review. The current study measured four process variables and four outcome variables, but learner control did not relate to them. The learner control literature and the current research show many differences in results, methodology and design. These differences make it difficult to accurately compare the research. This study did not help bring clarity to the concept of learner control. As discussed in a later section, one conclusion might be that it is time to stop studying learner control using the existing paradigm and find a new one such as considering it as an element of engagement.

The current study tried to learn from previous research and address some of the concerns raised about the learner control research (Reeves, 1993), but was not completely successful. Reeves (1993) specified a need for a precise definition of learner control. This study developed a definition of learner control based on the concept of non-linear training, which is controlled by the learner. This provided a framework for considering learner control and also for identifying contrasting types of control, such as non-linear training controlled by a computer. This study had some success at addressing the conceptual, definition issue. The second problem noted by Reeves (1993) was the need for a theoretical foundation. This study attempted to develop a model of learner control based on the principles of motivation. However, the results indicated that the model was not supported, so this study did not further the learner control research. If motivation is

one of the true foundations of the learning process in WBT, this study did not provide any supporting evidence. However, as noted later, many of the significant relationships in the post hoc model were the variables with a motivational foundation. These motivational aspects offer some promise and should be explored in future research.

This study did not overcome Reeves' third concern, which was the frequency of technical and methodological problems. Learner control seems to be a difficult design issue to manipulate. Similar to previous research, this study had difficulty creating an effective and realistic manipulation of learner control. For example, this study told the participants which condition they were in immediately prior to the pretest and consequently created an artificial effect. This effect was apparent through the correlation between the learner control condition and the pretest score (r=.14). Learners in the low control condition performed more poorly on the pretest, likely due to lower attention and motivation as a result of the condition assignment. The effect of the control condition did not play a role in later relationships, so the effect seemed to wear off after the pretest. It was hoped that the problem with the artificiality of revealing the condition would be overcome by the benefit of strengthening the manipulation.

The null effects for the rest of the learner control relationships indicated that the manipulation was probably was not very effective. Many researchers have tried different manipulations of learner control with mixed results. Learner control is a very individualized process, and perhaps it cannot be effectively manipulated to find solid results. In the limitations section, this issue of manipulating learner control was discussed in more detail. One proposition was that current methods of studying learner control are not fruitful, and alternative approaches should be considered.

Reeves' final concern was with analytical issues, such as small sample sizes and large attrition rates. This study did overcome those issues. The sample size of 236 had sufficient power for the analyses, and very few people dropped out of the study (usually dropped due to computer troubles). However, the large completion rate was also due to the study design. Having people take the course in a lab setting encouraged completion of the course. Completion rates would probably have been much lower if participants were instructed to complete the course on their own, as is common in real work settings. In summary, this study did not find any indication that learner control influenced process choices or final training outcomes. However, it was difficult to tell whether the null results were due to methodological problems or a genuine effect.

Engagement Choices

The engagement concept showed more promise than learner control. Engagement referred to the level of involvement of the learner. It was expected to be an important element of the learning experience, especially since this study involved a self-paced learning environment. When the learner is responsible for directing his or her own learning experience and for completing the material, involvement and motivation could be a critical factor for good performance. Skinner and Belmont (1993) found differences between the behavior of engaged and disaffected students, and this study also found effects for engagement.

In this study, engagement was conceptualized as a process variable that reflected choices made by the learner during the training. The engagement choices were operationalized as attentional focus and emotional engagement. Attentional focus was the learner's assessment of the amount of attention given to the training. Emotional engagement reflected the learner's emotional involvement and positive feelings during

the course. Hypotheses 1-4 all partially dealt with the influence of the four individual differences on the two engagement variables. No support was found for the relationships of attentional focus or emotional engagement to mastery orientation (H1) or to Web self-efficacy (H2) or to microcomputer playfulness (H4). No significant relationships were found during hypothesis testing or even with the zero-order correlations. These null results were surprising, especially the lack of relationship between mastery and the engagement variables. Earlier research found that engaged students were more likely to chose difficult tasks, initiate action and exert effort and concentration (Skinner and Belmont, 1993). These elements sound very similar to the description of people with high mastery orientation who like to explore tasks and have an intrinsic interest in learning (Ames, 1992; Dweck, 1986). Even so, this study found no relationship between mastery orientation and engagement. One possible reason for the null results was that mastery orientation and emotional engagement focused on different elements of the learning process. Specifically, mastery orientation focused on tasks and performance. Similarly, content choice was a behavioral choice that was task focused, and mastery orientation did have a positive relationship with it. By contrast, emotional engagement focused on feelings. These two elements of learning (task focus and emotional focus) might be different enough that they do not affect one another. A second possibility is that the mastery orientation variable did not have enough variance to show differences. The mean of mastery orientation was 4.02, indicating that many of the learners rated themselves high in it. The SD was only .42, indicating that there was limited variance in the measure. This homogeneity might have limited the relationship with emotional engagement. A third possibility is that the experimental design did not stimulate the

relationship. For example, the short duration of the course might have limited the effect of mastery orientation and emotional engagement, because the course was not long enough to call out differences.

Although emotional engagement was not related to mastery orientation, it did have a significant relationship with attitude toward WBT (H3). This provided the only significant relationship for H3. Learners who had a positive attitude about training on the Web were more emotionally involved in the experience. This supported previous research that also found a link between attitudes and engagement for distance learning (Webster and Hackley, 1997). The learner's attitude before the training could be considered an emotional state, and that emotional state influenced the learner's emotions during the training. Attitude toward WBT was not significantly related to attentional focus as also predicted in H3.

The first part of the model did not strongly support the engagement variables, but more results were seen for the second part of the model. The engagement variables showed relationships to two of the hypothesized training outcomes. Both attentional focus and emotional engagement were positively related to satisfaction as predicted in H7. Learners who chose to pay attention to the course and become emotionally involved were more satisfied with the training. Engagement during the training related to final feelings toward the training.

The results also supported H8, as emotional engagement was positively related to application self-efficacy. Learners who were emotionally engaged with the training were more confident in their ability to apply the information. H8 differed from the other hypotheses in that only one of the four process variables was predicted to influence the

application self-efficacy outcome. This decision was made for several reasons. First, this study expected that application self-efficacy would be related to the engagement variables and not to the behavioral variables. Similar to satisfaction, application self-efficacy is an affective outcome. Affective outcomes capture emotional responses to the training. The engagement variables are also affective in nature and therefore were expected to have more influence on application self-efficacy than the behavioral variables. Second, previous research failed to find a relationship between attentional focus and application self-efficacy (Brown, 1999). This finding led to the hypothesis being narrowed further, such that attentional focus was not expected to have a significant relationship with application self-efficacy. Third, emotional engagement had not been tested in relation to attentional focus. It seemed conceptually logical that the two could be related, since they are both affective and emotional in nature. Consequently, H8 only predicted a relationship between emotional engagement and application self-efficacy. As indicated earlier, H8 was supported, and additional analyses were done to confirm the lack of relationships with the other process variables. Post-hoc analysis (Table 16) supported the expectation that attentional focus and the behavioral variables were not related to application self-efficacy. There was an initial zero-order correlation (r=.28) between attentional focus and application self-efficacy, but this was not supported during the regression analysis. These results indicated that application self-efficacy could be largely explained by emotions during the training.

The model was examined to see if any mediation was occurring between the individual difference variables and the outcomes through the process variables. However, only one path met the criteria for mediation and was tested. The tested

mediation hypothesized that attitude toward WBT related to emotional engagement, which related to satisfaction, and attitude only related to satisfaction through emotional engagement. As seen in Table 13, this path of mediation was supported. Engagement facilitated the relationship between pre-training attitudes and post-training affective reactions. All three of the involved variables are affective and emotional in nature, indicating the importance of feelings during learning experiences.

No support was found for H9, which predicted a relationship between the two engagement variables and declarative knowledge.

Behavioral Choices

In addition to the relationships between engagement variables and individual differences and training outcomes, the behavioral choices also showed some relationships. It was expected that choices, such as whether or not to view a page or complete an optional exercise, would relate to the individual differences and outcomes. Learners who had high scores on the individual difference variables were expected to make more behavioral choices during the training. The logic was that learners who were active during training and made good choices would perform well on outcome measures. This study found limited support for some of these expectations.

Behavioral choices were operationalized as content choice and activity level. Content choice measured the number of times the learner accessed pre-defined "important" learning items, and activity level considered the overall number of non-required pages accessed by the learner. Hypotheses 1-4 all included relationships between the individual difference variables and the behavioral choice variables. Results indicated that activity level was not related to any of the four individual differences, providing no support for that part of H1-H4. Similarly, no relationship was found

between content choice and Web self-efficacy (H2) and attitude toward WBT (H3). However, content choice was related to mastery orientation and microcomputer playfulness. As predicted in H1, learners who were more mastery oriented in their learning made more of the targeted learning choices. This finding supported previous research. People with mastery orientation believe that effort leads to successful outcomes and enjoy the challenge of learning (Ames, 1992; Dweck, 1986). This translated well to the self-paced learning environment of the WBT course. Specifically, it seemed as if the learners with high mastery orientation made the extra effort of identifying the important learning concept and of choosing the targeted items. Previous research found a link between mastery orientation and effort (Fisher & Ford, 1998). However, this current study seemed to suggest that choosing good learning items was more important than unqualified, overall effort. These results indicated that learners did not simply exert more overall effort when they were high in mastery orientation, because the activity level element was not significant. More specifically, learners high in mastery orientation expended more effort on choosing important learning concepts. Mastery orientation seemed to help learners focus their extra effort on making good choices.

A significant relationship was also found between content choice and microcomputer playfulness. However, the significant relationship was opposite of the hypothesized relationship, so no support was found for that element of H4. It was originally hypothesized that learners who interact positively and imaginatively with computers would make more of the content choices, due to interest in the novel training format. The opposite was found in that people high in microcomputer playfulness made fewer of the important learning choices. One possibility was that learners who enjoyed

playing on the computer were off-task, exploring other elements of the course and were distracted from the content. However, the lack of relationship between microcomputer playfulness and activity level indicated that the learners were probably not off exploring other sections of the course. Of all the relationships hypothesized between the individual difference variables and the process variables, only three were significant. Two of those three involved content choices, but one of those relationships was in the opposite direction.

Some relationships were also found between the behavioral choice variables and the two hypothesized outcomes. H9 predicted that the four process variables would relate to declarative knowledge, as measured by the posttest. As mentioned earlier, the engagement variables did not relate to declarative knowledge. Activity level also proved not to be related to declarative knowledge as seen in Table 11. Choosing to view more pages did not seem to influence final performance on the posttest. However, content choice was positively and significantly related to declarative knowledge in partial support of H9. Targeted learning choices were designated as such, because the content related to the material on the pre and posttests, and they were represented in the learning objectives. Since the material in the targeted items was directly related to the material on the posttest, this significant relationship is very logical. Learners who chose to read or complete the targeted learning items performed better on the test. It is likely that the learners were consciously noting the material in the pretest and attending to the learning objectives in order to ascertain which pieces of content were important. By choosing the important pieces, the learners who made more content choices had corresponding success on the posttest. The pretest and the learning objectives were probably acting as advanced

organizers to inform learners about the important concepts of the training.

H10 predicted that content choice and activity level would predict skill-based learning. Skill-based learning was measured by performance on two essays that asked the learners to apply the change management concepts from the WBT course. Results (as seen in Table 12) indicated that content choice was not related to performance on the essays. However, a marginally significant relationship was found between activity level and skill-based learning, providing partial support for H10. This indicated that learners who viewed more pages during the training performed better on the transfer essays. Although the information on the extra pages was not necessary for strong performance, it was likely that the learners benefited by having concepts reinforced.

One of the interesting findings of this study was the link between mastery orientation, content choice and declarative knowledge. Mastery orientation was related to making more of the important learning choices. Making those important learning choices was related to performing well on the posttest. Although these relationships did not meet the criteria for testing mediation, this series of relationships highlighted the importance of considering learning in a process model.

Post-hoc Models

The model hypothesized in this study did not perform well. However, several significant relationships were found indicating that choices made during training can affect outcomes. There were enough significant relationships and significant zero-order correlations to suggest that something measurable was occurring, even if it was not the hypothesized model. Following this assumption, several post hoc analyses (Tables 15-24) were conducted to try to determine what story the data could tell.

Some of the analyses expanded on the original model and entered additional

variables into some of the regressions. For example, Table 15 showed that content choice was related to satisfaction even after accounting for the hypothesized relationships (attentional focus and emotional engagement). This indicated that learners who chose the targeted learning items were more satisfied with the course. Perhaps participants who made more of the good content choices were satisfied, because they used their additional knowledge to perform well on the posttest.

Except for identifying unhypothesized relationships, it was not productive to be constrained by the original model. Consequently, effort was focused on identifying an alternative model. The first step to identify a new, motivational model was to consider a foundation that could tie an alternative model together. In this case, satisfaction seemed to be a likely candidate. Satisfaction had more significant relationships in the regressions and the zero-order correlations than the other variables. One concern was that the training literature did not seem to view satisfaction as a critical learning outcome. However, examination of the correlation matrix (Table 3) indicated that satisfaction was significantly and positively correlated with the other outcome variables: declarative knowledge (r=.27), skill-based learning (r=.19) and application self-efficacy (r=.62). This raised an interesting question about the possibility of satisfaction mediating the relationship to the other outcome variables. A model was tested that included the variables that had shown significant relationships with satisfaction or the other outcome variables. As seen in Table 20, satisfaction was related to application self-efficacy, even after controlling for the process variables. Learners who enjoyed the training experience had more confidence that they could apply the information. The analysis also showed the positive relationship between emotional engagement and application self-efficacy. The

mediation test in Table 21 supported the idea that the relationship between emotional engagement and application self-efficacy was fully mediated through satisfaction. This suggested that people who felt happy and emotionally involved during the training were more satisfied, and this satisfaction helped them feel more confident about applying the information later. Additional analysis (Table 22) showed that satisfaction was marginally related to skill-based learning. Satisfied learners performed better on the essays. Satisfaction and content choice were both significantly related to declarative knowledge (Table 23). Content choice remained significantly related to declarative knowledge, even after accounting for satisfaction. This indicated that content choice was only partially mediated through satisfaction, because it also had a direct relationship with declarative knowledge. Satisfied learners and ones who made the targeted learning choices scored better on the posttest. Model fit analyses of the post hoc model in Figure 5 indicated good fit for the model. Satisfaction with training did appear to be an important part of the relationship between the process variables and the final outcomes. This post hoc model suggested that satisfaction with training could be an often overlooked, but important, element of training.

Individual Differences

This study found disappointing results for the individual difference variables. Very few of the hypothesized relationships were significant. Mastery orientation was related to content choice in partial support of H1, and attitude toward WBT was related to emotional engagement in partial support of H3. Additionally there was a relationship between microcomputer playfulness and content choice, but it was opposite the hypothesized direction. It indicated that people who had playful, positive attitudes

toward the computer actually made fewer of the important learning choices.

None of the other hypothesized relationships were significant, but some unhypothesized relationships were. For example, attitude toward WBT had a direct relationship with satisfaction as seen in the post hoc analyses. Mastery orientation was directly related to application self-efficacy and to skill-based learning. Brown (1999) found a similar relationship between mastery orientation and application self-efficacy. However, he also found that application self-efficacy was related to performance orientation and technology self-efficacy, and these relationships were not supported in the current study.

There are many potential explanations for the poor performance of the individual difference variables in this study. These possible explanations include: the possibility that individual differences do not affect process variables, poor choice of variables included in the study, and design constraints. The first possible explanation is that individual differences do not affect process variables (or at least the process variables included in this study) as much as they influence the final outcomes. Many existing training studies considered the effect of individual differences on training outcomes without considering process variables. For example, Warr and Bunce (1995) found that positive attitudes to training led to better learning scores. The meta-analysis described earlier by Colquitt, LePine, and Noe (unpublished) also found relationships between trainee attitudes and outcomes such as self-efficacy, declarative knowledge, skill acquisition and reactions. These studies focused on a direct relationship between individual differences and outcomes, without considering the learning process.

However, some studies have found relationships between individual differences

and process variables. Brown (1999) considered the relationships between individual differences and process variables, and found results that conflict with the current study. Specifically, Brown (1999) found that learning goals (mastery orientation) and performance orientation and technology self-efficacy were related to attentional focus. None of these relationships were supported in the current study; attentional focus was not related to any of the individual differences. The results from Brown (1999) suggested that individual difference variables could affect process variables. This is logical since individual differences need some mechanism for translating themselves into differences on training outcomes, and the learning process is a likely mechanism. Although previous research focused on relationships between individual differences and final training outcomes, the results found by Brown (1999) highlighted the need for additional research on the relationship between individual differences and process variables.

Th second possible explanation is that the current study chose the wrong individual difference variables, and other ones would have had more impact. No demographic information was collected which precluded analyses such as the correlation between age and computer savvy or the differences in the learning process between men and women. It might also have been useful to measure some individual differences, such as personality characteristics, that differed more from the other variables. The attitude toward WBT, computer playfulness and self-efficacy variables were all directly tied to reactions toward computers. With a fairly homogenous sample (all university students), there was not as much difference in computer experience. In fact, participation in the study required basic Web knowledge, because participants had to sign up for the sessions using a Web-based subject pool system. In hindsight, the study should not have focused

so many individual difference variables on computer issues.

Other individual differences might prove more valuable in a similar process model. Some possibilities would be a personality measure such as conscientiousness and a motivational measure such as motivation to learn. It seems likely that conscientiousness could relate to process variables such as attentional focus and content choice. Conscientious participants would be more likely to pay attention to the content and choose the critical learning information. Conscientiousness could also be closely tied to completion, if a study was conducted in non-lab setting. If participants were responsible for their own time and completion, conscientiousness might give them the volition they need to persevere and complete the course. Motivation to learn could also have been a valuable individual difference measure. In this study, participants received credit for taking part in the study, and they did not have another external reasons (such as a grade or job performance) to attend to the material and learn it. Differences in the learning outcomes might be a result of the differences in motivation to learn, with participants who had an intrinsic interest in the material performing better. Additionally, another individual difference that might have had an influence was a measure of general ability or cognitive ability (g). General ability could be tied to the ease of learning new concepts. It could also be linked to more non-linear learning, if higher ability helped participants recognize opportunities for personal control.

Design constraints could have been a third reason that the individual difference variables did not perform well. As mentioned earlier, participants may or may not have had interest in the content, which might have affected their motivation to learn. The content in the course was about Change Management, which was not directly related to

class work or job needs for many of the participants. The material was intended to be understandable but novel for participants. However, a few of the participants mentioned that they had studied the same concepts in their business and management courses. Research conducted in the field, such as Brown (1999), should have had more relevance for the learners and therefore engaged them better in the learning. Since it was not measured, it was unknown whether relevance or familiarity influenced these results. The context of the instruction could have been another design issue. The course was primarily focused on teaching declarative knowledge such as vocabulary and concepts. There were some case studies and exercises that attempted to translate the knowledge into practical application, but they were not the focus of the course. It was possible that this method of teaching was less stimulating for the participants and did not catch their intrinsic interest. A course designed with more practical application (and relevant content for the participant) might have improved interest in the material and affected results. Another design issue might have been related to the basic nature of WBT. Specifically, the technology of WBT might have distracted learners from the content. Learners might have been clicking on screens to see what would happen, instead of clicking to learn the content. The process variables in the study were measuring the actions and reactions of the participants during the training. If the actions and reactions were dictated by the training design, it was possible that individual differences did not have much impact on the process.

There are many possible reasons that the individual difference variables did not have many significant relationships in this study. Due to some of the study constraints, it would be premature to conclude that individual differences do not affect the learning

process. It would be more responsible for future research to include alternative individual difference variables, chose participants with varied computer experience and measure the motivation to learn the content.

Limitations

Some of the limitations of this study were discussed in the previous section, but some additional concerns include methodological issues and the manipulation of learner control.

Methodological issues. There were several methodological issues with this study. One issue was that the study was conducted with a student sample in a laboratory setting. This decision was made in order to allow the use of two experimental conditions (high and low learner control) and to ensure larger sample sizes. However, the trade-off was that the participants were not in a work setting with actual work-related performance outcomes related to the training. As mentioned earlier, the laboratory setting made the learning itself less relevant to the participants and removed any consequences of poor performance. They were not required to know the content for a course or to perform better on their job. This dynamic might have changed their interest in the content and consequently their motivation to learn. To determine the true impact of learner control and engaement and WBT in a work setting, field data should be collected. Participants who see the training as relevant and important are likely to proceed and perform differently.

Along the same lines, the laboratory setting, allowed control and consistency in the learning environment, but that did not necessarily reflect the reality of WBT in organizations. WBT courses are often taken by learners on their own, in a non-protected environment such as at their desk in an open cubicle area. Non-laboratory settings open

the opportunity for many distractions such as ringing phones, co-worker interruptions and other noise. Furthermore, the learner would probably be trying to focus on training, while other people in the area are doing other work tasks, adding another distraction. It could be important to study the learning process for WBT in the workplace with these distractions as a measured variable. A first step might be to collect some qualitative and quantitative data concerning the effect of environmental distractions. This could provide a catalog of common distractions and eventually lead to possible solutions for them. Another step would be to consider how distractions and individual differences such as conscientiousness and perceived utility of content could influence persistence and completion of the course.

Manipulation of learner control. Another limitation was the manipulation of learner control. It is possible that learner control has no significant affect on the learning process as indicated by this study. However, it is equally likely that the manipulation of learner control used in this study was ineffective and therefore did not stimulate any differences. The manipulation varied the learner's control over taking required exercises and jumping to different sections of the course. These are some of the classic variations of control as described in the literature (see Merrill, 1984, Chung & Reigluth, 1992). However, perhaps these variations are not the key ones.

In the search for clarification of the learner control results, the manipulation used in this study was more closely examined. Specifically, it needed to be determined whether or not the learner control manipulation in this study was successful. Did participants in the high control condition use their control and choose paths that were more non-linear? This could help determine whether the manipulation itself failed or

whether learner control truly did not have an effect on training behaviors and outcomes. In order to explore this question, the data were examined to determine the timing and order that pages were hit in the course. Due to the possibility of limitless variation in page order, a specific combination was investigated based on the participant's page choice after the jump menu page. The jump menu page was the first and primary page that allowed non-linear access, because the content list was linked for the high control condition and not linked for the low control condition. Of the 236 participants, only 11 people (4.6%) varied from the linear path at that choice point. Of the 11 non-linear paths, three of the participants did not make content choices, instead, they chose to explore the resources sections (such as vocabulary, etc.). Of the three vocabulary paths, two of those were in the low control condition. The final breakdown showed 10 participants in the high control condition (8.4% of condition) who chose to take a content-related, non-linear path through the course. This did indicate that some participants did take advantage of the non-linear path, so learner control research may have some hope in the future. However, the numbers were not strong enough to assert that this specific manipulation was successful. It has been a repeated conclusion from previous research that learner control is difficult to measure and study. Either the manipulation of it needs to be re-thought, or the construct itself should be revised.

Additional thought should go to identifying other elements of training that might effect the learning process if controlled or not controlled. Since earlier research found mixed results with learner control manipulations, this study attempted to strengthen the effect by telling the participants which level of control they had. This was a very artificial manipulation, and did not improve the study. The only noticeable effect was a

negative one, in that it seemed to influence scores on the pretest. The participants took the pretest immediately following the announcement of their control condition. Participants with less control seemed to lose some interest and performed more poorly on the pretest. This effect seemed to disappear after that point.

The mixed results surrounding learner control research and the difficulties of manipulating it could be a sign that researchers are approaching the issue incorrectly. The questions up to this point have been about the value of learner control and how to strengthen the manipulation of learner control. Perhaps these are the wrong questions. It may not be useful to study learner control in its current form, instead it could be studied as part of a larger construct. Cordova and Lepper (1996) found compelling evidence that engagement can be enhanced through the types of features available in WBT. They varied their programs on three elements: contextualization, such as fantasy themes (no fantasy versus space ships and treasure hunts), personalization (references to child's name, friends and favorite toys) and provision of choices (allowed to make small, non-instructional choices). They found that all three elements increased the specified outcomes. In the Cordova and Lepper (1996) conceptualization, learner control was only one element of the bigger construct of engagement. Engagement was a key concept in the current study, but learner control was treated as a separate concept. The results for learner control might have been stronger if it had been conceptualized as part of the engagement concept. Previous null and conflicting results for studying learner control indicated that a new tactic might be needed, and considering learner control as part of a larger concept might be the solution. Instead of searching for ways to strengthen the manipulation of learner control, it might be more fruitful to re-conceptualize it as part of

the engagement concept.

Summary. Based on the results of this study and the limitations, one conclusion was that the accepted methods for studying learner control should be re-evaluated. It is possible that learner control should not be studied as a primary focus. Instead the focus should be on larger concepts such as engagement, which might include the concept of learner control. Another conclusion could be that learner control should be studied, but the control given to learners should be over non-instructional elements. That would guarantee a minimal level of exposure to important material for each learner. The learner would have a feeling of control, while still having a robust learning experience. One overall weakness of the current study was that the initial focus was on the Web medium, and the research design followed from that focus. The proper focus should have been self-paced learning, with the Web medium being just a research design choice. The key to this study was the learning of the participants, but the focus was often on the medium.

Directions for Future Research

Satisfaction. One direction for future research would be to test the importance of satisfaction in other learning environments, both self-paced and instructor-led. Satisfaction is often added to research as an after-thought outcome, but this study indicated that it might deserve more primary attention. Satisfaction could be treated as a mediator, as in the post hoc model. It could also be looked at longitudinally to see if changes in satisfaction affected motivational direction, intensity or persistence.

Another direction would be to consider how course design could influence satisfaction. Satisfaction is one element of the ARCS model developed by Keller (1988). The ARCS model was intended to explain individual motivation in learning and help designers integrate motivational strategies into instruction. The model contains four

elements related to the motivation to learn: attention, relevance, confidence, and satisfaction. Attention involves arousing and sustaining curiosity and attention, similar to the idea of volition. Relevance involves connecting the instruction to important needs and motives. Confidence involves developing confidence in success and generating positive expectancies, similar to the idea of task self-efficacy. Satisfaction involves motivation based on the learner's reaction to the course and outcomes.

According to Keller and Suzuki (1988) satisfaction affects continuing motivation as long as effort is consistent with expectations and outcomes, and the learner feels good about the outcomes. Keller and Suzuki's model (1988) approached satisfaction from a motivational framework, which is consistent with the theoretical basis of this study. Using the Keller and Suzuki (1988) model as a guide, future research could investigate the instructional design strategies that could influence and enhance training satisfaction.

Volition. As discussed earlier, motivation includes three elements: direction, intensity and persistence (Kanfer, 1990). Direction and intensity were measured in the current study through content choice, attentional focus and activity level. However, persistence was one element that was not strongly represented. One direction of future research could be to include a persistence element as operationalized through volition.

In self-paced learning, one of the greatest challenges is keeping the learner focused and on-task long enough to complete the course and adequately learn the material. One source indicated that as many as 30-50% of students who start a distance education course drop out before finishing (Moore & Kearsley, 1996 cited in Cornell & Martin, 1997). Many recent learning theories have studied the effect of pre-training motivation and learning strategies on learning goal attainment (such as completing the

course and learning the material). One element that is sometimes missing from this research is a representation of the motivational process during the learning event.

Some researchers have added this representation by indicating that, "...volitional processes mediate the road from intention to attainment (Garcia, McCann, Turner, & Roska, 1998, p. 392)". Volitional processes are thoughts and behaviors that maintain the learner's intention to attain a goal (such as complete the course) despite internal and external distractions (Garcia, et. al, 1998; Corno & Kanfer, 1993). Persistence and effort are dimensions of motivation, but distractions can occur to divert the effort and persistence required for a task (Garcia, et. al, 1998; Kanfer & Ackerman, 1989). Many school tasks such as term papers and preparing for finals require sustained effort over days or weeks. In self-paced WBT, students usually take the course in short segments over time at their own discretion. At any point during this time, learners could get distracted and never complete the task. Volition is a measure of the motivation for maintaining persistence and effort to the goal.

In the Action-control theory, Kuhl (1984) divided goal-directed activity into a pre-decisional phase and a post-decisional phase. In the pre-decisional phase, the motivation to learn is established and goal setting and efficacy analyses are initially done. This provides the energy and direction for the action. The post-decisional phase involves implementation of goals by using learning and volitional strategies to accomplish the academic task (Garcia, et. al, 1998). Volition could actually play a mediating role between pre-training motivation and learning strategies. When implementation of an intention is threatened by internal or external distraction, volitional control would activate in order to counter the competing distraction.

Garcia, et. al (1998) studied the effect of volition on learning strategies and the motivational antecedents of volition. They surveyed 487 university students about goal orientation, task value, self-efficacy, test anxiety, volition and learning strategies related to their course. Their results indicated that volition was positively and significantly related to the learning strategy measures (time management, concentration, information processing, use of study aids, self-testing, and test-taking strategies). Furthermore, 21% of the variance in volition was accounted for by four variables (intrinsic goal orientation, task value, test anxiety, self-efficacy). They supported the Action-control theory (Kuhl, 1984) by finding that volition did mediate between intention to learn and goal striving.

Volition could be an important factor in the motivational process of learning. Trainees with high measures of volition would be more likely to stay focused and on-task. This feature could be especially relevant in self-pace WBT in which the learner must maintain his or her own motivation and contend with many environmental distractions. Future motivational models of the learning process in self-paced environments such as WBT should include the concept of volition. Volition could be especially important for field research in the workplace, because of the high potential for environmental distractions.

Encouraging engagement. This study provided some evidence of the importance of engagement, feelings and satisfaction during training. Another direction for future research would be to test different ways to encourage and promote engagement. This research could help determine the strategies that keep the interest of learners and encourage attention and completion. One possibility for encouraging engagement would be to simulate social interaction in WBT. This could occur through personalized

messages including use of the learner's name and feedback tailored for the learner. Another possibility would be to have a guide character that could appear throughout the course and provide feedback and encouragement to the learner. One facet of WBT that is growing fast is to use a hybrid approach to training, which also increases social interaction. This combines WBT with an instructor-led portion. Often, the learners complete pre-work and assessments online and learn basic knowledge through a WBT course. After completion of the Web portion, learners are brought together for an instructor-led portion. After the course is over, support information can also be provided on the Web. This approach might encourage engagement with the Web sections of the course. Learners might expend more effort and focus if they know they will be required to know the information in a public, social setting.

Another method for encouraging engagement could be to enrich the learning environment – especially in self-paced environments. In WBT this could be done through rich graphics, increased interactivity, and more use of simulations and case studies. As always, it is important to make sure that the instructional design takes precedence over support materials such as graphics. Harp and Mayer (1997) tried to encourage emotional involvement by adding interesting, but irrelevant material (such as cartoons or illustrations), to a lesson. The interesting material was hypothesized to energize the learner and therefore increase attention, encoding and learning. As described earlier, Cordova and Lepper (1996) found that contextualization, personalization and provision of choices could affect outcomes and intrinsic motivation. Most of the research done on encouraging engagement in self-paced learning has been done in schools with children, and it would be interesting to see a study done with adults.

Adults might react differently to engagement tactics, such as having a negative reaction to a theme that was juvenile or condescending. Engagement promises to be an important element in WBT, but it still needs to be researched and investigated for further understanding.

APPENDICES

APPENDIX A: SURVEY AND TEST ITEMS

* = removed items

Manipulation Check – PILOT test only (completed after all other measures)

1. I felt like I had a lot of control over my learning in this Web-based training course.
2. The computer allowed me to make my own learning choices.
3. The computer controlled me too much during the training (R).
4. I was able to decide how to proceed through the course.
5. I had the option to change the order in which I learned the material in the course.

Mastery Orientation

1. I do my best when I'm working on a fairly difficult task.
2. When I have difficulty solving a problem, I enjoy trying different approaches to see which one will work.
3. I try hard to improve on my past performance.
4. The opportunity to do challenging work is important to me.
5. The opportunity to extend the range of my abilities is important to me.
6. The opportunity to learn new things is important to me.
7. I prefer to work on tasks that force me to learn new things.
8. When I fail to complete a difficult task, I plan to try harder the next time I work on it.

Web Self-efficacy

1. I am confident I can have a basic understanding of the World Wide Web (WWW).
2. I am confident that I can do an excellent job of using the WWW.
3. I am confident that I will be able to learn and gather information using the WWW.
4. I am certain I can master the skills needed to effectively navigate the WWW.
5. Compared with other students, I think I know a great deal about the WWW.

Attitude toward Web-based Training

1. I enjoy taking Web-based training courses.
2. I would rather take a course on the Web than in a classroom.
3. I do not have any interest in taking a Web-based training course. (R)
4. I think Web-based training has great potential for expanding education.
5. I believe there is a lot of course material that could be taught through a Web-based course.
6. I think I can learn a lot through a Web-based course.
7. I think the Web is only good for games and is not good for learning. (R). *
8. I like that I will be able to guide my own learning through a Web-based training course.

Microcomputer Playfulness

The following questions ask you how you would characterize yourself when you use computers. For each adjective listed below, please select the number that best matches a description of yourself when you interact with computers. (seven point scale - strongly disagree to strongly agree)

1. Spontaneous
2. Unimaginative (R)
3. Flexible
4. Creative
5. Playful
6. Unoriginal (R)
7. Uninventive (R)

Attentional Focus

1. I am thinking about how well or how poorly I am doing. *
2. I am daydreaming while I am learning.
3. I am losing interest in learning the material for short periods of time.
4. I am thinking about other things I have to do today.
5. I have let my mind wander while I am learning the materials.
6. I am concentrating on the training materials (R) *

Emotional Engagement

1. The graphics and interactivity of this course are keeping me interested.
2. As I am taking the course, I am bored. (R)
3. I am actively participating in learning the content during this course. *
4. I am interested in the course.
5. I am curious about the functionality and design of the course.
6. I am enjoying taking this course.
7. I feel anxious while taking this course. (R) *
8. I am just clicking through this course without focusing too much on it (R). *
9. As I am taking this course, I am happy.
10. I feel personally involved with the course.
11. This type of training arouses my imagination.

Declarative knowledge test (Pretest and Posttest)

Module 1: Concept of Delta

1. Transitioning from the present state to the future state is a concept called:
   a) Transition
   b) Delta
   c) Synergy
   d) Momentum

2. Which of the following concepts refers to the size of the change between what is and what is desired to be?
   a) What Is/ What Not Change
   b) Delta deviance
   c) Change differential
   d) Magnitude of the gap

3. Which of the following is an element of change?
   a) Quality
   b) Resources
   c) Consequences
   d) All of the above

4. Which of the following is NOT a helpful hint for presenting a change to employees?
   a) Focus on feelings first and information later
   b) Focus on including employees for a win-win situation
   c) Discuss the importance of the change for national economics
   d) Acknowledge the need for help from internal resources

5. The role of a sponsor is to:
   a) Be accountable for the outcomes related to change
   b) Carry out the daily change plan
   c) Redesign all internal processes and procedures
   d) All of the above

6. Transitioning from the present state to the future state requires:
   a) A formal change plan
   b) A vision statement describing the future state
   c) Leadership commitment and support throughout the process
   d) All of the above

7. In defining change, which of these factors does NOT belong?
   a) A majority of the employees must agree with the change
   b) The quality of the change
   c) The consequences of not achieving the future state
   d) When the change should take place

8. A change agent is:
   a) A member of management who helps identify the target population
   b) A person accountable for putting the change in place
   c) A person who self-selects to lead change
   d) A team of employees selected to accelerate change

9. Momentum is defined as:
   a) Process of creating organizational support for a change
   b) The high-speed journey to change
   c) The pace of communication needed in change efforts
   d) Environmental pressures that force a change

10. Change has occurred when:
   a) The change agent says it is complete
   b) The large majority of those affected accept it
   c) Other companies in the industry recognize the change
   d) Performance by individual employees improves

11. A stakeholder matrix is an analytical tool that can be used to enroll the target population. What are the two axes of the matrix?
   a) Cost of the change & Impact on the change
   b) Job title & Level of support for the change
   c) Impact on the change & Level of support for the change
   d) Tenure with the company & Union membership

12. "Unfreezing" an organization refers to:
   a) Thawing each employee's emotions through individual communication
   b) Breaking up natural day-to-day inertia to get change started
   c) Warming up employees to the nature of change
   d) The process of understanding obstacles to making the change

13. Critical mass is created when:
   a) External problems make change necessary
   b) All communication plans have been activated
   c) The most critical problems are given the most attention
   d) A majority of employees are committed to working on the change

14. Which of the following is NOT one of the four actions of momentum to move from a present to future state?
   a) Create
   b) Prevent
   c) Stop
   d) Reengineer

Satisfaction with Training

1. I enjoyed this Web-based course.
2. I feel fairly satisfied with how much I learned in the course.
3. Most people will be fairly pleased with this course.
4. I am satisfied with the chance I had to learn new things in this course.
5. I worked well by myself in this course.
6. I am satisfied with the amount of control I had during the course.
7. I am glad I had a chance to take this course.
8. Overall, I am satisfied with my experience with this course.

Application self-efficacy

1. Even though I may have some difficulty, I know that I will be able to develop a change plan.
2. I am concerned that I do not know enough to effectively implement a change plan. (R)
3. I am confident that I can use the skills from the change management course.
4. I am comfortable applying the change management process to problems in my own life.
5. I am confident that I learned enough to improve the way I handle change events in my life.

APPENDIX B: ACTIVITIES AND SCORING SHEETS

ID# _____

Final Activities

Read the following scenario and consider what you would do in that situation. Write your answers in the empty spaces. Both activities refer to the same scenario and require that you put some thought and effort into your answers.

Scenario

You are the manager of a music store in a college town. The owner of the store has decided to start selling CDs over the Internet and has put you in charge of managing the change effort. You will still need most of your sales staff to work in the store, but 25% of the employees will have to be re-trained to work in customer service for the Internet site. There is some grumbling in the company, because the employees think you are trying to "do away" with salespeople. You know that you will need salespeople for the store and customer service people for the website. Until now the music store has not changed much for the thirty years that it has been in business. You will have to carefully consider how to manage this change for the store.

You now have two activities to complete. In the first activity, you will make a list of tasks that need to be done to make the change successful. In the second activity, you will write a speech to explain the change to the other employees.

Activity 1

Develop a change plan for this scenario. Make a list of tasks that you would do or organize from start to finish to make this change successful. Explain each step. You should focus on the change issues and do NOT need to focus on technical issues such as setting up the website.

Activity 2

Your boss wants you to make a speech about the change to the employees. Write the speech you would use to describe the change to them. You can make up facts and statistics to support your presentation.

Application Exercise
Activity Test Key

Based on the content presented in the course, acceptable answers for each activity have been identified. There are two ways to earn points – by including target items and by mentioning specific vocabulary words. All of the rating points will be added up (for both ways to earn points in both activities) to get a total score for each participants.

The first way of earning points involves presenting a list of the target items for each activity. Some items have italicized examples of acceptable answers. This list is the full set of possible answers. The essay answers for each participant will be analyzed to determine if the answer has the items in the target list. Each participant will have a rating for each item on the list. The rating scale for each item will be as follows:

0 = Participant does not mention the target item in their essay.
1 = Participant mentions the item in the essay. Does not completely explain it or demonstrate knowledge or only mentions part of target item.
2 = Participant completely discusses the target item. Correctly answers and applies knowledge of the item.

Participants are not expected to discuss all of these items. Any items not covered by this list will not be counted at all.

The second way to earn points will be to include specific target vocabulary words. Participants will receive one point for each vocabulary word they include from the target list. Each vocabulary word can only earn one point within an activity even if it is used more than once. A word can earn two pints total if it is used in both of the activities.

Activity 1: Scoring

	Item
1	Develop a change plan. *Organize the effort; Make a strategy.*
2	Set up a timetable for the change steps. *Decide schedule or deadlines – when things will happen.*
3	Describe the business case for change. *Determine reason the change is important – competition; new Internet opportunities; expand business.*
4	Hold an employee meeting to announce the change.
5	Invite questions and dialogue. *Questions are encouraged and welcome. Ask employees to give input and feedback.*
6	Have ongoing meetings or informal discussion with employees to keep track of their feelings toward the change effort.
7	Send the message through different organizational levels. *Have supervisors talk to their direct reports.*
8	Review progress against goals. *Track performance. Keep records and communicate how the change is progressing.*
9	Share information about competitive or benchmark companies that have implemented similar changes. *It has worked for other stores.*
10	Find a sponsor for the change. *Choose someone to be in charge.*
11	Present a vision of the future. *Plan to be top Internet retailer in 5 years or increase revenues by 25%.*
12	Recognize personal achievements and team efforts. Provide monetary rewards. *People who do well will get raises.*

Vocabulary Words
Delta
Transition
Present state (present)
Future state (future)
Sponsor (s)
Magnitude of Gap (Gap in Magnitude)
Milestone chart (milestones)
Change Plan (Plan or Plan for Change)
Timetable/ timeline
Business Case
Unfreeze or freeze or refreeze
Stakeholders
Crisis situation

Activity 2: Scoring

	Item
1	States that there will be a change to start selling CDs over the Internet.
2	States that some of the salespeople will have to be re-trained to work as customer service representatives.
3	Some sales people will stay in their current jobs. *The store will not be "doing away" with salespeople. No threat to jobs; job security.*
4	Describe the business case or specific benefits for change. *Determine reason the change is important – competition; new Internet opportunities; expand business. You will earn more money. Revenues will go up. Costs will go down.*
5	States that the business has not changed much, but it is time to change now. *Move to future.*
6	Share information about competitive or benchmark companies that have implemented similar changes. *It has worked for other stores.*
7	Asks if there are any questions.
8	Discusses the timing of the change (how soon or when the change is to take place). *When training or site design will start.*
9	Discusses the consequences of the change. *What will happen if change does not occur --go out of business; lose customers.*
10	Discusses the change from the employee's point of view. *Change may be scary. You may be worried. You will have great opportunities. Uses the word "you".*
11	Includes new statistics to support the speech.
12	Uses motivational language to get people excited. *This will be great for us! We can all pull together and make this great!*

Vocabulary Words
Delta
Transition
Present state (present)
Future state (future)
Sponsor (s)
Magnitude of Gap (Gap in Magnitude)
Milestone chart (milestones)
Change Plan (Plan or Plan for Change)
Timetable/ timeline
Business Case
Unfreeze or freeze or refreeze
Stakeholders
Crisis situation

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