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The Role of Educational Technology and Motivation in Increasing Flow and Time-On-Task to Enhance Learning

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ABSTRACT

An abstract of the thesis of Michael Pullmann for the Master of Science in Psychology presented August 21, 1998.

Title: The Role of Educational Technology and Motivation in Increasing Flow and Time-on-Task to Enhance Learning.

Technology plays an increasing role in college courses. Student experiences and outcomes may be significantly altered by high-tech course presentation and flexible formats. Models from psychology, such as Csikszentmihalyi's flow theory are useful for understanding quality of experience. Dweck's motivation theory explains why some students may not experience the flow state during school work. The purposes of this study were to: 1) Determine if students in technology-enhanced courses differ from other students on the experience of flow, 2) Test the relationship between flow, motivation orientation, and time-on-task, and 3) Test the relationship between motivation orientation, time-on-task, and student outcomes.

Forty college students were randomly selected from four technology-enhanced and four control courses at Portland State University. Participants carried a two-way pager for eight days and responded with their activity when paged. Participants also completed a flow questionnaire and motivation questionnaire.

No significant differences were found for the conditions of flow between technology-enhanced and control courses. Two linear regressions were used to test the

relationship between the conditions of flow, motivation orientation, and time-on-task. The model for time-on-task for attending class was significant at p=.032; as goal clarity increased and/or as the balance of challenges and skills increased, time-on-task increased. Zero-order correlations for time-on-task for studying showed that as learning goals and/or feedback clarity increased, studying increased.

Eight multiple linear regressions tested relationships between conditions for flow, motivation orientation, and results of flow. The models for concentration while studying and attending class were both significant. For attending class, increased learning goals were related to increased concentration. Increased learning goals and increased performance goals were related to increased concentration while studying.

Many of these results are consistent with previous research on flow, motivation, and student outcomes. While there were no differences found between technology-enhanced and control courses, technology contains many tools which may positively influence improved student outcomes.

THE ROLE OF EDUCATIONAL TECHNOLOGY AND MOTIVATION IN INCREASING FLOW AND TIME-ON-TASK TO ENHANCE LEARNING

by

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The Role of Educational Technology and Motivation in Increasing Flow and Time-on-Task to Enhance Learning

On many college campuses today, a sense of boredom, listlessness, and meaninglessness has invaded the experience of students. This situation is far from an optimal experience. School becomes a chore to complete, education only a requirement for a future occupation rather than the end-in-itself it could be. This boredom is reflected in the participation of those affected. It has been demonstrated through research that time-on-task is the best predictor of class grades--and if students feel no passion for what they are doing, they will not spend the time-on-task necessary to achieve a quality understanding of the material (Astin, 1993). When motivated towards the intrinsic aspects of experience, people become absorbed into their actions and spend more time performing them (Miller, et al., 1993).

For educators, the question becomes how to motivate students to enjoy classwork, learning, and contributing to the course. Mihaly Csikszentmihalyi offers a solution for reclaiming a quality meaningful experience in mundane life. Through flow theory, he provides suggestions for supporting optimal experience in all situations (Csikszentmihalyi, 1990). As an alternate conceptualization for the experience of flow, this thesis examines the motivational theory of Deci and Ryan, and explores its many similarities to flow.

This thesis proposes that the flexibility offered by technology's presence in the classroom provides many of the conditions for supporting the liberating flow

experience and intrinsic motivation. The freedom of actions, the clear goals and rules of such activities as web-based tutorials, the immediate feedback of an interactive experience--all of these conditions may provide a foundation for flow. This thesis examines the relations between technology, motivation, flow, and learning in college courses.

Technology in College Courses

Technology use in colleges has jumped dramatically within the last few years. The 1995 Campus Computing Survey showed that 55.2 percent of educational institutions had a web page; public universities led the pack with approximately 98 percent displaying a web page (Green, 1996). Once relegated to outside the classroom, technology has increasingly filtered into classroom use. Between 1994 and 1995 the percentage of college courses using technology resources such as e-mail and multimedia presentations more than doubled, with six percent of all college courses using World Wide Web (WWW) resources to support instruction (Green, 1996). These numbers are expected to continue to climb.

However, the definition of technology in the classroom is rather vague. It could be argued that any materials other than books, chalk, and a board are "technology"; in this sense the use of an overhead projector would be considered technology in the classroom. This thesis follows that of Ostrogorsky (1997) in defining the technology enhanced course as, "a course that has integrated one or more

of the following into the course curriculum: e-mail; computer generated presentations (e.g. PowerPoint); computer generated graphics (e.g. SuperPaint); live Internet searches; animation and simulations; discipline specific software as well as appropriate classroom assessment techniques" (p. 3). While classroom assessment techniques (CAT's) are not specifically technology-based, for the purposes of this thesis they will be considered as such because of an inseparable employment of both high-technology and CAT's in the classroom. Web-based course tutorials and web sites should also be included in this definition.

Portland State University is riding the wave of the complete multimedia experience with the development of Harrison Hall, a 9000-square foot room which seats nearly 400 students or conference attendees and contains some of today's most advanced multimedia technologies (PSU pamphlet). With a Power Macintosh 9500, an Orange Micro 486i PD, two VCR's, a laser disk, a closed circuit TV receiver, a CD/cassette player, two slide-to-video transfer systems, a WolfVision 3D projector, and a remote-control mouse, instructors can engage students in a true multimedia extravaganza on the three 9- by 12 foot, high-resolution video screens at the front of the room. Each screen can be used separately or in conjunction with the others. As well as Harrison Hall, other classrooms have had high-tech teaching tools built on, for instance Cramer Hall 250.

In addition to in-class technology, many courses have developed a web site containing some of the following: a class syllabus, direct e-mail to instructors and teaching assistants, a pre-enrollment self assessment quiz (students are expected to take the quiz at the beginning of the term, and they receive immediate on-line feedback on their readiness to enter the course), grades, lecture outlines, simulations, and interactive tutorials. For an example of a well-constructed web site, see Appendix A, or go to: http://www.irn.pdx.edu/~colliep/course/soc339/soc339.htm. This page clearly presents its structure while offering freedom for exploration. The pages are detailed enough to provide sufficient information, yet they are not so lengthy they require a great deal of time for downloading. There is no distracting information, but there is enough color and interesting images to maintain the user's attention. These aspects are important for flow and will be discussed below.

Many of the courses using Harrison Hall and implementing web pages are a direct result of a project in progress by Drs. Nancy Perrin and John Rueter. Designed to improve students' experiences in large classrooms, establish a technological infrastructure for curricular development, and evaluate the effectiveness of educational technology on student learning and cost efficiency (Perrin and Rueter, 1995), this project is funded by the Fund for Improvement of Post-Secondary Education (FIPSE). This thesis is a branch of the FIPSE project.

The FIPSE project team works with faculty to implement technology and assessment into their course design. An ultimate goal is to link learning objectives, technology, and assessment into a functional whole; a dynamically shifting course emerges, constantly reforming itself, using technology to doubly measure and achieve course goals. In the first year of the project, faculty integrated multimedia presentations and e-mail into particular courses. The focus was on the use of the tools provided in the technology-enhanced room. The second year of the project brings expanded web pages, with tutorials and pre-enrollment self-assessment quizzes; as the faculty gained proficiency with the use of the technology-enhanced room in the first year, the second year focuses on technology outside the classroom.

Technology-enhanced classes are expected to improve the quality of experience for students. This position is supported by research on motivation and the phenomenon of flow. This thesis will define and describe flow, explain its connection to learning, theorize on the functions of flow, and connect flow to two theories of motivation. Hopefully, the research on motivation will serve to bolster the weaknesses in flow theory.

Flow Theory

Flow is, "the way people describe when consciousness is harmoniously ordered, and they want to pursue whatever they are doing for its own sake" (Csikszentmihalyi, 1990, p. 6). It is the feeling one has when experiencing intense

discovery and mastery of optimal challenges. Through flow, one develops increasingly effective skills as each new round of challenges are overcome. When in the experience of flow people report being more concentrated, happy, satisfied, friendly, free, cheerful, strong, open, creative, and involved (Carli, et al., 1988; Massimini & Carli, 1988). The flow experience has been studied in a wide variety of groups, including adolescents (Larson, 1989), employed women (Allison, M.T. & Duncan, M.C., 1988), elderly Korean immigrants (Han, 1988), ex-addicts, blind nuns, college students, Navajo students, German-Walse individuals (Massimini et al., 1988), ocean navigators (Macbeth, 1988), and many others. Every group describes the experience of flow in very similar terms: an optimal experience in which challenges match skills, time seems to speed up, concentration is intense, action and awareness seems to merge, and increased complexity of the self develops.

Flow and Learning

Flow experiences may not always be pleasant, but they are always enjoyable. This is a critical distinction. Pleasure results when consciousness is restored to order after needs of the body intrude, such as eating food when you are hungry. Enjoyment occurs when one goes beyond physical or biological yearnings and moves forward, becomes more complex, grows. Enjoyable activities are not always pleasant--a mountain climber's lungs scream, heart pounds, and arms ache, yet the experience is enjoyable. Flow is enjoyable, it produces a more complex individual. Empirical

studies have provided evidence that flow builds self-esteem and personal complexity (Wells, 1988; LeFavre, 1988).

Through the discovery and mastery of optimal challenges, one develops and refines his skills and abilities to create a complex and intricate human being. Flow thus becomes a constant struggle for higher quality learning, renewal, and accomplishment. The experience of flow is enjoyable and fun, while at the same time it is hard work; these two aspects allow learning through flow to be of a higher quality. It is theorized that flow also provides meaning, fulfillment, a sense of accomplishment that buffers against existential dread much more effectively than automatic adherence to culture or religion (Csikszentmihalyi, 1990).

Through flow, life can be given meaning from an internal phenomenological experience, rather than the externally imposed blind following of culture. As Carl Rogers wrote, "The way to do is to be; the way to understand is from within." (1969, p. 87). If the activities of day to day existence could allow for flow, a deeper meaning and higher-quality experience would be squeezed from even the most mundane activities. Studies consistently show that increases in the amount of flow one experiences are associated with improved quality of experience (LeFevre, 1988; Moneta & Csikszentmihalyi, 1996; Wells, 1988).

The Functions of Flow

Flow, according to Csikszentmihalyi, provides a shield against the anxiety inherent in the human dilemma. Csikszentmihalyi argues that the random, chaotic nature of the universe is indifferent to human desires and needs. Historically, culture has provided the shield to defend against the uncontrollable future; all cultures take it for granted that they are the center of the universe, the "one nation under God". Some sort of defense is necessary because a sense of meaninglessness, anxiety, and existential dread hovers in the wings for every human being. As Ernest Becker (1973) wrote: "As an animal organism man senses the kind of planet he has been put down on, the nightmarish, demonic frenzy in which nature has unleashed billions of individual organismic appetites of all kinds--not to mention earthquakes, meteors, and hurricanes, which seem to have their own hellish appetites." (p. 53-54).

Traditionally, culture buffered the angst of isolation and this, by itself, is not problematic (May, 1969). However, when confronted with real challenge, those taught by their culture to expect unlimited, unending progress lose courage, abandoning faith in everything they have learned. The shield dissolves and the absence of inner order fills one with an emptiness referred to as "existential dread", "epistemological anxiety", or the "existential vacuum" (Frankl, 1984; Becker, 1974). Without real conviction, modern man "goes through the motions", feeling no passion

or zest for life because of the betrayal of the cultural shield. As science progresses, our objective importance diminishes--"we are just forgotten specks drifting in the void" (Csikszentmihalyi, 1990, p.12).

Many people try to ignore or shut out the dis-ease entering them by throwing themselves into the culture, becoming in Earnest Becker's words the "automatic cultural man" or in Kierkegaard's, "the Philistine" (Becker, 1974, p. 74). This attitude is prevalent in society today; examine the boredom and listlessness present in many college classrooms as students automatically go through the motions culturally prescribed to them (Frankl, 1984). Similarly, Csikszentmihalyi says people handle this ontological anxiety by doubling their cultural shield--acquiring newer and better cars, more power, a more glamorous lifestyle. Others attack the symptoms of the problem by dieting, plastic surgery, assertiveness training, and other piecemeal solutions but, "there are too many dams to burst and so little time to attend to them all" (Csikszentmihalyi 1990, p. 13). If culture is no consolation, oftentimes people immerse themselves in the traditional opiate of blind religious following. In this era of scientific rationality, the adherence and full acceptance of many religions require an intentional ignorance of how the world works--hardly a healthy answer to existential dread. It follows that only through personal action can one hope to escape from this dilemma; this is the classic existential concept of "knowing by doing" (May, 1969).

But how does one throw himself into life, how does a person truly live in each moment? Because, as Csikszentmihalyi writes, "if a person learns to enjoy and find meaning in the ongoing stream of experience, in the process of living itself, the burden of social controls automatically falls from our shoulders" (1990, p. 19). No longer will rewards and answers be out of reach, but instead immersed in the passing of each moment. The answer, argues Csikszentmihalyi, is found by controlling consciousness and subverting anxiety through the experience of flow, becoming the "autotelic personality".

Attempts to control consciousness have been done as long as human records exist; in the west we see it in the writings of Aristotle, Stoic philosophy, Christian monastic orders, and Freud. The east gave the world Taoism, Zen Buddhism, and Yoga (Csikszentmihalyi, 1991; May, 1962). But control over consciousness does not remain static; it must constantly change with history and culture. This is the beauty of flow--immersing yourself in action is not necessarily some mystical experience requiring hours of intense meditation, completely separate from today's world. A yogi's actions are unbelievably amazing, but so are those of a great mechanic or professor completely engaged in her work. When there is order in consciousness, when one's goals match the information entering one's consciousness, psychic energy comes naturally and a flow experience ensues (Csikszentmihalyi, 1990). It makes

sense to examine the experience of flow to find its necessary conditions, allowing the development of structure most likely to lead to flow.

In his research, Csikszentmihalyi found that, regardless of the age, gender, social class, culture, or activity in which they were involved, the participants described activities that were going well in very similar ways. Eight distinctive components emerged from in-depth interviews and scientific assessment (Csikszentmihalyi, 1990). These aspects are specified as either conditions for flow or results of flow; while this distinction has been made for the practical purposes of this thesis, according to Csikszentmihalyi the flow components are intertwined (Csikszentmihalyi, 1992). First to be discussed are the main components of the actual feeling of flow, or flow experience, then the conditions necessary for flow will be outlined.

Components of Flow

The first component is **concentration on the task at hand**. The complete focusing of attention on the challenge allows one to forget the unpleasant aspects of life. It is as if only a very narrow window of information is allowed into awareness. This ability to escape may be the very reason behind practicing flow in rather odd conditions--for example, concentration camp prisoners who developed chess sets using rocks and dirt.

Second, the activity **merges action and awareness**. Action feels spontaneous or automatic, and action and thought are indistinguishable. Csikszentmihalyi provides

a good example of this in quoting a rock climber, "You are so involved in what you are doing [that] you aren't thinking of yourself as separate from the immediate activity" (1990, p. 53). This feeling is comparable to descriptions of a Zen state of transcendent action.

Similarly, the third component is the **loss of self-consciousness**. When attention is focused heavily, the focus on the self is diffused. While the self often has a very active role (a debater, for instance, is aware of his every thought, word, and action), what is lost is the concept of the self; the interaction between action and actor becomes intertwined and indistinguishable. The fourth component, the **transformation of time**, is also a side-effect of heavy concentration. Most people report that time shortens, hours seem to take minutes. Less frequently, people report the slowing down of time; a baseball player or golfer can feel every nuance of their swing in the quarter-second from start to finish.

Causes or Antecedents of Flow

The first antecedent is that the activity is usually **challenging and requires skills**. To clarify, "activities" and "skills" do not necessarily mean physical actions; reading is a case that often produces flow yet is very sedentary, but does allow for the investment of psychic energy into opportunities for action. Flow is achieved when the level of challenges matches the level of skills and both of these levels are higher than the average for the person (Massimini & Carli, 1988), see Figure 1. Studies typically

operationalize flow as those moments when challenges and skills are reported to be balanced. When challenges are greater than skills, anxiety is reported, when skills are greater than challenges, boredom is reported, and when challenges and skills are in balance but below the average level, apathy is reported (Csikszentmihalyi & Csikszentmihalyi, 1988). The argument that a balance of challenges and skills produces complexity in an individual is supported in other psychological theories, most notably Piaget's.

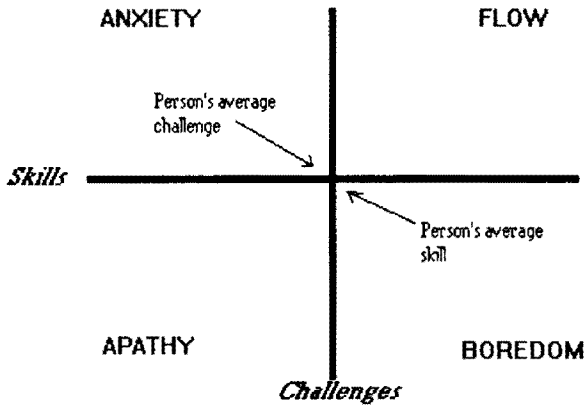


Figure 1: The association of the balance of challenges and skills to flow, anxiety, apathy, and boredom (Csikszentmihalyi & Csikszentmihalyi, 1988)

The second and third conditions for flow are **clear goals and immediate feedback**. Engagement in competitive sports clearly demonstrates these conditions. Less obvious are activities such as painting or composing music; however, these

activities demonstrate how goals and feedback can be set internally. The kind of feedback is unimportant as long as it allows one to gauge progress towards the goal.

The fourth cause of flow is the **"paradox of control"**. The flow experience is frequently described as, "lacking the sense of worry about losing control that is typical of many situations in one's life" (Csikszentmihalyi, p. 59). The feeling may not be actual control, but the possibility of control. For example, mountain climbers derive a thrill not from danger, but from a belief in their ability to minimize, or control, it. Even in gambling, an activity that appears to be completely out of control, chance-takers are convinced that it is their ability that allows them to win and not luck. Gambling also demonstrates the potentially negative aspect of flow--addiction to the created order in total absence of developing real order in one's life.

Flow is a positive experience that produces a more complex human being, ready to face increasingly greater challenges with increasingly refined skills (Csikszentmihalyi, 1988; Csikszentmihalyi & LeFevre, 1989). As each challenge is overcome, the individual has developed complexity of thought and action. As studies cited above have repeatedly shown, this development of skills through an even matching with challenges feels good, it provides an optimal quality experience. Intrinsic motivation could be seen as the motivation needed to achieve the flow state--learning not for external rewards but just for the feeling that learning provides. Psychological theories of motivation closely match flow theory, especially Deci and

Ryan's self-determination theory and Dweck and Legget's social-cognitive motivation theory.

Motivation

Intrinsic Motivation and Flow

Deci and Ryan's self-determination and cognitive evaluation theory of intrinsic motivation appears to study the same target phenomenon as flow, but contains a different explanatory basis for its development (Deci & Ryan, 1985). In education, this theory concerns itself with promoting an interest in learning and confidence in capabilities (Deci et al., 1991). Self-determination theory's explanation for the flow-like phenomenon of intrinsic motivation primarily focuses on three "innate needs"--competence, autonomy, and relatedness. These can be conceptualized as parallel to the conditions/antecedents of flow. **Competence** is an understanding of how to influence outcomes, and effectiveness at performing the actions necessary to achieve these outcomes. **Autonomy** involves self-initiation and regulation of behavior; it is important not to think of autonomy as independence. Independence is the ability to care for oneself--one can have autonomy, or freedom from being controlled, while still being dependent on a provider (Ryan & Lynch, 1989). Finally, **relatedness** refers to "developing secure and satisfying connections with others in one's social milieu" (Deci et al., 1991, 327). Deci and Ryan hypothesize that these needs have evolutionary value; the strength of human beings is the power of our brain. Competence and

autonomy needs encourage the development and utilization of our brains; the constant conquering of optimal challenges leads to a more complex individual, more likely to survive and reproduce.

Using this rationale can help to explain why certain antecedents promote flow. The theory postulates that the satisfaction of these three needs through the environment contributes to motivation; the result or consequence of the satisfaction of these needs (intrinsic motivation) has its counterpart in the consequence of the satisfaction of flow's antecedents (the flow experience). The more an event allows the satisfaction of these needs, the more intrinsically motivated and individual should be (Deci & Ryan, 1985). Opportunities to fulfill the need for autonomy are especially important for self-determination, as they are necessary to decrease the feeling of being controlled. An event, internal or external, that contradicts any of these three needs is expected to decrease motivation (Kristjansson, 1993). This has been supported by a great deal of research, most memorably the classic studies in the 1970's where time spent on an intrinsically motivated activity decreased when the activity was rewarded and the rewards were then terminated. It is argued that rewards diminish the sense of autonomy and increase feelings of control. All other aspects being equal, students with high intrinsic motivation consistently perform better that students without high intrinsic motivation (Deci & Ryan, 1985). Similarly, positive feedback is expected to satisfy the need for competence and increase intrinsic motivation, while negative

feedback damages the sense of competence and decreases motivation (Deci & Ryan, 1985). Flow's antecedents (optimal challenges, sense of control, clear goals and feedback) all have a shared relationship in the satisfaction of one or more of the three innate needs.

Interpretation of Events

Organismically, the important point here is the functional significance of the event. In other words, it is not so much the event or environment itself that affects these needs as it is the meaning of the event to the person experiencing it: the event is filtered through the person's internal characteristics. For instance, it is possible that some people (perhaps Csikszentmihalyi's "autotelic personality" or Dweck's learning-goal oriented person) would perceive properly given negative feedback not as damaging to their competence, but as a boost to their autonomy or competence: it is as if these people see feedback as an addition to their knowledge base, an improvement for the next trial, an increase in the strategies they posses. Csikszentmihalyi similarly argues that it is the perceived challenges and skills, the perceived sense of control, etc., that causes flow. However, the idea of functional significance creates ideas necessary for proper experimentation.

Most importantly, experimenters must measure the environment along with the individual's perception of the environment. For instance, in two studies done by Ryan and Grolnick (1986), children who reported their classroom as being more "origin" in

nature (autonomy-supportive) were more likely to have high self worth, cognitive competence, internal control, and mastery motivation. Children perceiving themselves as "pawns" in the classroom (controlled) were less likely to have high scores on all of the above. However, the differences in the classrooms were due to individual rather that average classroom differences. Taking the concept of functional significance into perspective, it makes little sense to observe the objective world without consideration of people's cognitive filters and perceptions. Experimentation must be done taking the participant's frame of reference into account along with aspects which may affect that frame of reference. An aspect of the person which may affect how they perceive their situations in motivational terms has been studied under the title "goal-orientation".

Goal Orientation and Flow

Dweck and Legget's social-cognitive theory of motivation focuses on many issues surrounding student motivation and achievement (Schraw et al., 1995), and may help provide an account of the reasons why some people are more likely than others to experience flow. Student's beliefs about learning and ability affect academic achievement. According to Dweck (1986), people develop theories of intelligence according to their interactions with the environment. The entity theory is the belief that intelligence is a fixed trait which is innate, and no amount of effort can increase or decrease intelligence. This theory leads to the adoption of a maladaptive, performance-goals orientation. Performance-goal students are interested in obtaining

positive public evaluations and demonstrations of competence, without much desire to improve their knowledge (Miller et al., 1993).

The incremental theory of intelligence is the belief that intelligence is malleable and can change with effort. This theory leads to the adoption of an adaptive, learning-goal orientation. Learning-goal students are concerned with better understanding and increased knowledge. Negative feedback is perceived as a challenge rather than a threat (see Table 1).

Learning Goal Orientation	Performance Goal Orientation
Incremental theory of intelligence	Entity theory of intelligence
Focus on improving expertise	Focus on proving expertise
Greater persistence in difficulty	Less persistence in difficulty
Adaptive responses to challenges	Maladaptive responses to challenges
Negative feedback perceived as challenge	Negative feedback perceived as threat

Table 1: Comparison of Dweck and Legget's motivational goal orientations.

A learning orientation leads to adaptive responses to negative feedback such as persistence, strategy shifting, and increased effort (Roedel et al., 1994; Miller, et al., 1993). Learning is considered an end in itself. In contrast, performance-oriented individuals react to negative feedback by adopting learned helplessness, self-aggrandizement, and lack of persistence. Learning is considered a means to an end. They are less likely to use learning strategies because to do so would require effort and

imply a lack of innate ability, which these individuals do not want to accept (Nicholls, 1989 in Miller et al., 1993; Roedel et al., 1994).

Whether these two orientations interact is still being debated. Some researchers such as Miller et al. (1993) stand by the original theory of Dweck and Legget and choose the individual's classification into learning or performance-goal motivation based upon whichever orientation the subject scores highest. Other researchers argue that because the orientations are independent of each other, they must be considered together, essentially creating four types of goal configurations--low performance, low learning; low performance, high learning; high performance, high learning; and high performance, low learning (Schraw et al., 1995; Meece & Holt, 1993). This view has led to an interesting finding: a strong learning orientation leads to cognitive skills and strategies supportive of academic achievement, regardless of the performance orientation (Schraw et al., 1995). This implies that learning goals may have a compensatory role, offsetting the negative aspects of performance goals. In addition, the two orientations are consistently found to be independent of each other--correlational evidence shows no relation, as opposed to the inverse relation expected if they were not independent of each other (Meece & Holt, 1993; Schraw et al., 1995). These findings led this thesis to adopt the latter viewpoint of four goal configurations (see Table 2).

	Low Performance	High Performance
Low Learning	1	2
High Learning	3	4

Table 2: The four motivation configurations.

An additional factor adding complexity to the theory is that of confidence. Dweck argues that individuals with either goal orientation are very similar to each other in behavior if the subjects have high confidence in their ability. Only when doubting their abilities do individuals differ depending upon their motivation. This is consistent with Deci and Ryan, as a person who has high confidence is likely to have high feelings of control and competence. When faced with failure, high-confidence performance goal individuals are just as persistent and ultimately successful as high-confidence learning goal individuals. However, phenomenologically these individuals differ greatly. According to Koestner and Zuckerman (1994), confident learning motivated individuals react to failure in an interested, enjoyable way, attempting new strategies in order to accurately understand the situation and gather increased complexity. Confident performance individuals react to failure in a pressured, ego-involved manner, with no interest or enjoyment of the activity. While objectively the behavior of the confident performance-goal and confident learning-goal types is

similar, the actual experience of performance-goal individuals would hardly be considered optimal.

Other theorists discuss motivation in very similar ways. For instance, Lloyd and Barenblatt (1984) distinguished intellectuality for its own rewards from intellectual behavior motivated by ulterior purposes, labeled "need achievement". Similar to the notion of four goal configurations in Dweck and Legget's model discussed earlier, they found no relationship between the concepts of intrinsic intellectuality and need achievement. Intrinsic intellectuality was positively correlated with scholastic achievement with the covariant of IQ removed, while need achievement showed no relationship.

Flow, Intrinsic Motivation, and Goal Orientations

The findings of researchers studying Dweck and Legget's, and Deci and Ryan's, theories are consistent with those of flow theory. An individual high in learning goals could be thought of as Csikszentmihalyi's "autotelic personality", or someone who performs an action for the personal rewards flow provides. A performance oriented individual could be considered the "automatic cultural man" discussed earlier, consistently desiring status, achievement, and objective success. Viewed in this way, motivation orientation is an aspect of the individual, whereas flow is an aspect of the situation's interaction with the individual. Motivational orientation could act as the filter through which the individual derives functional significance of

the situation. The individual could experience flow, depending on the satisfaction of the requirements of flow, or perhaps the satisfaction of the three needs discussed earlier.

Csikszentmihalyi postulates that autotelic personalities find a deeper meaning or value to their actions than others. Learning oriented participants consistently demonstrate higher intrinsic and extrinsic valuing of their actions (Miller et al., 1993). The seeking out of challenging activities to match skills against, the desirability of both negative and positive feedback, and the loss of self-consciousness are components of both the autotelic personality and the learning-goal motivated individuals.

In addition to this, the persistence of learning goal individuals could be seen as a version of Csikszentmihalyi's intense concentration and feelings of control during flow. Another component of flow, the sense of control, is a major component of confidence. Flow could be the description of the phenomenological state that learning goal individuals are motivated to achieve. It could be the feeling one has when satisfying one or more of the three basic needs. Indeed, Deci and Ryan write, "intrinsic motivation is the innate, natural propensity to engage in one's interests and exercise one's capacities, and in so doing, to seek and conquer optimal challenges" (1985, p. 34, emphasis added). This state may be made easier or more difficult to

achieve depending on the interaction between the situation and characteristics of the individual, in other words, the situation's functional significance.

In essence, Deci and Ryan's theory aids in bolstering flow theory by separating the antecedents from the descriptions of flow. Especially through the insertion of autonomy and competence, flow's components become much more explanatory in nature. Dweck and Legget's goal orientations describe the theoretical mechanisms which create the functional significance of situations to individuals. Together, these theories of motivation fill in the gaps of flow theory. We will now examine the role of technology in this paradigm.

Technology, Flow and Motivation

It appears that flow results from a complex interaction between the individual's characteristics and characteristics of the situation. Both the concepts of flow and intrinsic motivation are ever-changing with the situation, the person, and his perceptions. Indeed, depending upon the calibration of measurement and the internal experiences of the person, one could have dozens of so-called "microflow" experiences a day, or one could have only a few, very intense flow experiences in a lifetime (Csikszentmihalyi, 1992). Motivation orientation, on the other hand, is an aspect of the individual; while it develops over time in interaction with the environment, it is largely considered stable and independent of situations (Hayamizu & Weiner, 1991).

Almost any activity can be a flow experience, as long as it has clear structure: rules, goals, and feedback, and as long as the situation is not perceived as threatening. The clear structure can be internally or externally imposed; depending upon the individual, a challenge may be perceived as a major threat or an opportunity to excel. Motivation orientation might play the role of a filter in the flow process. The external situation filters through one's motivation orientation. In this model, the same set of objective conditions would lead to a different result of flow, depending on a person's motivation orientation. In effect, motivation orientation acts as a filter which alters a person's perception of any particular situation. Technology-enhanced courses present students with all of the necessary conditions for flow, and contain many of the aspects of experience resulting from flow. An instructor equipped with knowledge of the antecedents to flow and intrinsic motivation can use technology to open the door to a higher quality experience for students.

Technology's influence on the conditions for flow and motivation

Challenges and skills. Technology-enhanced courses can allow greater opportunity for action, or for using skills to match challenges. The actual classroom, as in Harrison Hall, is equipped with large, clear, easy-to-see screens and professors' voices are projected with microphones. Psychic energy can only be invested in opportunities of which one is aware. These devices make presentation of information more accessible to students, increasing the opportunities for action.

Outside of the classroom, e-mail and course web sites also increase the opportunities for action. Through e-mail, students can participate and interact with relative anonymity, reducing the fear many students have of speaking in public. The flexibility of web-based technology is continually its most beneficial aspect. Studies of flow consistently find that activities offering the most flexibility within structure are related to the flow experience (Csikszentmihalyi & LeFevre, 1989). Web sites and e-mail help to satisfy the need for autonomy by allowing self-initiation, exploration, and regulation of behavior. It has been shown that an autonomy-supportive classroom leads to intrinsic motivation and perceived cognitive competence (Ryan & Grolnick, 1986). In addition, autonomy supportive classrooms are associated with mastery motivation, which describes a preference for challenging situations (Ryan & Grolnick, 1986).

A good course web site, with an interactive nature, allow students to set their own challenge level to match their skills by working faster or slower, or using external links to quickly gather relevant information from other sources. In addition, the web-based pre-enrollment self-assessment quizzes allow students to test their ability to do well in the class prior to actually taking it. Students who feel that their skill level does not match the course challenge level can take a more appropriate course. Balanced challenge and skill levels, along with levels of challenges and skills higher than a person's average, produces the optimal flow experience.

The links between flow and intrinsic motivation are clear: being able to match skills with challenges is an autonomy-supportive idea; actually working through challenges successfully, and thus creating more complex and difficult tasks, is a competence-supportive idea. Web-based tutorials, assessment quizzes, and links to external information support an active student role, which is expected to help satisfy competence and autonomy needs, and found to lead to higher exam scores (Benware & Deci, 1991). Also, college students who have choices on which tasks to engage and the amount of time to spend on each are more intrinsically motivated that those assigned tasks and times (Zuckerman et al., in Deci et al., 1991).

Motivation can act as a filter to alter the objective conditions of flow. Learning motivated individuals perceive new experiences as an opportunity to learn new skills, increase their abilities, and build knowledge. Performance motivated individuals perceive new experiences as an opportunity to demonstrate their innate ability to outperform others. Using such a maladaptive view, these individuals appear more likely to perceive new technology as a major threat and challenge to which they do not have matching skills. Instead of utilizing technology's flexibility, it is expected that these individuals will become highly anxious in technology-enhanced classrooms.

Clear goals and feedback. Instructors are so burdened, especially in very large classrooms, that students often do not receive the kind of individualized feedback necessary for optimal experience. The use of an automated feedback system through

the Internet allows individualized feedback when it traditionally would not be feasible in large classes. It is only through feedback that one can, "seek and conquer optimal challenges"; without feedback there would be no point of reference or guide to progress.

In one location, the web site, students can read the goals of the course (in the syllabus and learning goals section), they can get the information needed to achieve the goals (through tutorials, simulations, lecture notes, and pre-enrollment quizzes), and they can get instant feedback on their progress towards these goals (through tutorial quizzes with feedback forms, pre-enrollment quizzes, e-mail, and grade responses). The goals and feedback are perceived as highly structured when presented in the sequenced manner of a web site; even if in reality they are no more structured than in a traditional course, it is the perception that is the foundation for flow. Positive feedback has already been shown to contribute to feelings of competence and lead to greater intrinsic motivation. This is only if the feedback is perceived as non-controlling (not as a reward). Unfortunately, if feedback is negative, performance motivated individuals adopt ineffective strategies to deal with the problem. Their perception is that negative feedback is a threat rather than information to be utilized.

Control. Studies of flow routinely find that being able to control the challenges and skills allows increased opportunities for flow (LeFevre, 1988). The flexibility and autonomy offered by web sites present students with increased control

over their participation in the classroom. The ability to e-mail instructors or contribute to a threaded discussion list allows shy students access to participation. Being able to find other aspects of the class such as lecture outlines, tests, and office hours in one location is expected to give students the sense that they have greater control over their participation and activity level in the course. Control is obviously an aspect of autonomy and, less distinctly, competence. To be able to control something is to be able to demonstrate competence. As discussed earlier, college students with more control over their tasks were more intrinsically motivated to study than those with less (Zuckerman et al., in Deci et al., 1991).

Of course, for the above conditions for flow, it is important that "technology", whether a course web site or PowerPoint presentation, be executed in a clean, well-organized, quality way. In addition to the many broad characteristics of any learning experience, a good web site should have most or all of the following: clear organization with flexibility, sufficient length and succinct pages, interesting images without too much clutter, and relevant links that aren't too distracting. The key to all of these is balance, support for autonomy (flexibility), and opportunities to build competence (feedback/information). Pages should not be too long; the time it takes to download an intricate, lengthy page is time in which the user grows bored, restless, and loses the feelings of control necessary for flow.

Technology's influence on the results of flow

Through technology's effects on the conditions of flow, it is expected that the results of flow will be altered. That is to say, if students feel more control over their coursework due to on-line tutorials or access to e-mail, they are more likely to enter the experience of flow and encounter the results of flow. This thesis adopts the view that the following results of flow could also be conceptualized as the feeling one has when engaged in a task that is intrinsically motivating and perceived as non-threatening.

Merging of action and awareness and **Loss of self-consciousness.** To be able to fully capture students' attention in the classroom is part of quality teaching, which may or may not be affected by technology; certainly technology provides more tools to the instructor who has the skills to use them effectively. It follows logically that of two equally talented instructors, the one with the most resources at her command (assuming she is proficient at using them) will more likely draw her students into a concentrated learning experience.

The usefulness of web pages as merging action and awareness and losing self-consciousness is obvious to anyone who has searched for information using the web. It is easy to become absorbed; energy flows smoothly as one jumps through links, weaving through well-arranged pages. Again, see Appendix A for an example of a

web site that flows easily from page to page. Indeed, even the term "surfing the web" denotes this feeling of flowing, merging action and awareness.

Concentration of the task at hand. The clear, linear "windows" of the computer screen focuses one's attention, acting almost as a blinder to outside events. A well-constructed web page and well planned lecture should be interesting to look at; using the tools available on the web and in the technology equipped classroom can bring a multimedia experience that focuses attention and concentration by obscuring outside distractions.

Transformation of time. Most people who feel comfortable using the Internet have had an experience where they lost track of time while visiting web sites. The Internet has become a topic of dispute in many households due to its ability to draw one's concentration to the point of forgetting how long one has spent flowing through sites.

All of the preceding results of the flow experience are thought to be more likely to occur in individuals high in learning motivation. The external focus of performance-motivated individuals is expected to alter their perception of the situation, creating high-self consciousness and low concentration; an anxious, striving will to excel drowns out intrinsic enjoyment. Although their grades and performance might be high, the qualitative experience is low.

The overall model of this thesis proposes that technology performs the following: Through a flexible format, technology helps to provide competence, autonomy, and an increased sense of control, it bolsters the intrinsic motivation towards flow, achieved while engaging in on-task behavior. There is a caveat: For students who are uncomfortable with technology, perceived competence and skills drop and perceived challenges rise, leading to a non-intrinsically motivating, anxious experience. Performance-goal individuals are more likely to perceive any negative feedback as a threat to their competence and will also lose intrinsic motivation and the flow experience.

Because flow is such a phenomenological, qualitative experience, it can rarely be captured in traditional experimental settings such as the laboratory or on questionnaires. "Time diaries" or recollective questionnaires were flawed for revealing many of the subtle dimensions of immediate experience (LeFevre & Csikszentmihalyi, 1989). The development of improved methods for studying immediate experience was imperative. A style of research method called the Experience Sampling Method arose as a means of capturing the daily experience of participants, including thoughts, actions, and emotions.

The Experience Sampling Method

The Experience Sampling Method (ESM) arose as an alternative to "time diaries" in which participants were asked to record events at specific times in the day.

A study using ESM traditionally has participants carry signaling devices ("beepers"), alerting them either randomly or in some pre-programmed manner to fill out a questionnaire. The frequency, intensity, and patterning of three major types of data can be examined this way: daily activities, psychological states, and thoughts (Csikszentmihalyi & Larson, 1987; Hormouth, 1986).

ESM studies have used wristwatches, radio-controlled beepers, random beepers, and computer programmed beepers. Typically the signaling device is small and unobtrusive, often including a "vibration" option to avoid the disturbance of a beep. In most studies subjects are signaled seven times a day, but this has varied between one and forty times a day (Csikszentmihalyi & Larson, 1987). They can be signaled randomly throughout the day or at pre-programmed times; often studies signal participants at a certain time of day when the studied activity is most likely to occur. ESM has been used to study flow (Csikszentmihalyi, 1988), the experience of freedom (Csikszentmihalyi & Graef, 1980), the quality of subjective experience (Moneta & Csikszentmihalyi, 1996), high-achieving adolescents (Mei-ha Wong & Csikszentmihalyi, 1991), personality theory (Hormuth, 1986), self-awareness theory (Duval & Wicklund, 1972, in Hormuth, 1986), and many other topics (see Hormuth, 1986, Csikszentmihalyi & Larson, 1987, and Robinson, 1985).

Benefits of ESM

ESM's most obvious benefit is ecological validity (Hormuth, 1986). Previous researchers attempted to capture real-life experience by following the participant throughout their daily life, recording actions at set times. This was not optimal in terms of preserving the true environment or in collecting large amounts of data. Studies requiring subjects to record their own actions each day or after a set interval were plagued by overestimation of most activities, and underestimation of such activities as time spent idling (Robinson, 1985). ESM allows access where researchers would not be able to go: into the stream of actions, thoughts, and moods of a participant's daily experience. The patterns and dynamics of these variables can be studied in a rather unobtrusive and non-threatening way.

Drawbacks of ESM

The most serious limitation to ESM is the reliance on subject's self-reports (Csikszentmihalyi & Larson, 1987; Hormuth, 1986). Evidence of bias exists for particular activities: sex, illegal activities, and bodily functions (Larson, 1989). Sports, socializing, and time away from home are underrepresented in many studies, presumably due to participants leaving the signaling devices at home. Ironically, other studies have found that in-home activities were underrepresented, presumably because participants left the device on a table and did not notice the signal while at home, but

when away from home the beeper was noticed due to its proximity (see Hormuth, 1986, for examples). As well as missed signals, relying on participants self-reports makes determining the reliability of their answers difficult. Participants are left alone for long periods of time, receive little training on objective ratings, and have considerable interest in presenting a good image of themselves.

Similarly, there is a self-selection bias in participants who would volunteer for an ESM study. While reimbursement for participation is expected to ease some of this bias, it is suspected that individuals involved in considerable illegal or illicit activities would choose not to participate. However, most studies find little or no socio-economic status (SES) differences in participation rates. Some studies have found differences in participants who had to be removed from final data analysis because of poor quality or incomplete data. Larson (1989) for instance, found that participants who had to be discarded had lower average SES levels, lower GPA's, and were rated as less mature. This indicates that low functioning students may be misrepresented in an ESM study.

Another potential drawback of ESM is the possibility of self-focused attention, or a loss in validity due to the awareness of the pager. For example, a conscientious student may want to represent herself in the best possible way, yet be unwilling to lie about her behavior. The beeper may make her notice more accurately how little studying she does. She may increase her study habits for the week of participation

because of the increased attention on her activities. While logical, the problem of self-focused attention has not been a problem in most ESM studies. Using the Self-Consciousness Scale, Fenigsteir, Scheier, and Buss (1975, in Hormuth, 1986) tested participants before or after two days of participation in an ESM study. If participation increases self-focused attention, the subjects participating should have higher self-consciousness scores. This was not found to be the case. Therefore, ESM does not seem to significantly change the everyday perceptions and situations of participants.

Proposed Research

The conceptual model of the relationships between motivation, flow, and learning are outlined in Figure 2. In this model, technology enhances positive conditions for flow. These conditions are experienced differently by individuals depending on their motivation orientation and comfort level with technology. The waving lines symbolize a filter through which the conditions pass before influencing the results of flow and student learning.

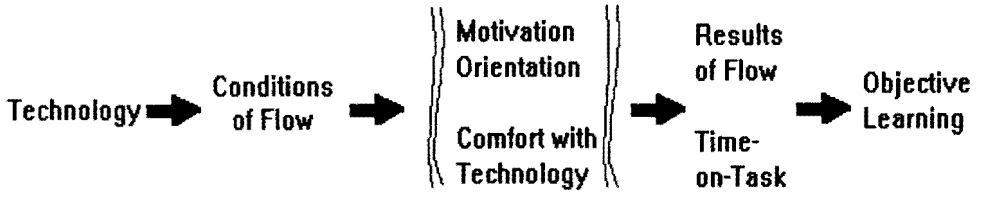


Figure 2: A hypothetical model of technology's effect on flow and objective learning, filtering through motivation

Hypotheses

As discussed earlier, the four conditions of flow match aspects of technology-enhanced courses, so it is expected that technology will encourage increased levels of flow. Hence, the first hypothesis:

Hypothesis 1: Higher reported levels of the four conditions for flow in on-task activities will be seen in technology-enhanced courses when compared to traditionally taught courses.

The experience of flow in on-task activities is expected to increase time-on-task due to the intrinsic rewards provided by flow. On-task activities are those activities related to coursework. Past research has demonstrated that learning-motivated individuals are interested in activities due to the intrinsic rewards provided. This leads to increased persistence in the face of challenges and negative feedback. However, for individuals who are uncomfortable with technology, the presence of technology in the classroom is expected to increase the perception of on-task activities as more challenging than what their skills can handle, leading to anxiety and less time-on-task. Hence, Hypothesis 2:

Hypothesis 2: The four conditions of flow, comfort with technology, and the interaction of learning and performance motivation orientation will predict time-on-task such that:

- As the four conditions of flow increase for on-task activities, time-on-task increases.
- As comfort increases, time-on-task increases.
- There is an interaction between performance and learning motivation on time-on-task: high performance/high learning motivation and low performance/high learning motivation are associated with high time-on-task; high performance/low learning motivation is associated with medium time-on-task; low performance/low learning motivation is associated with low time-on-task (see Figure 3).

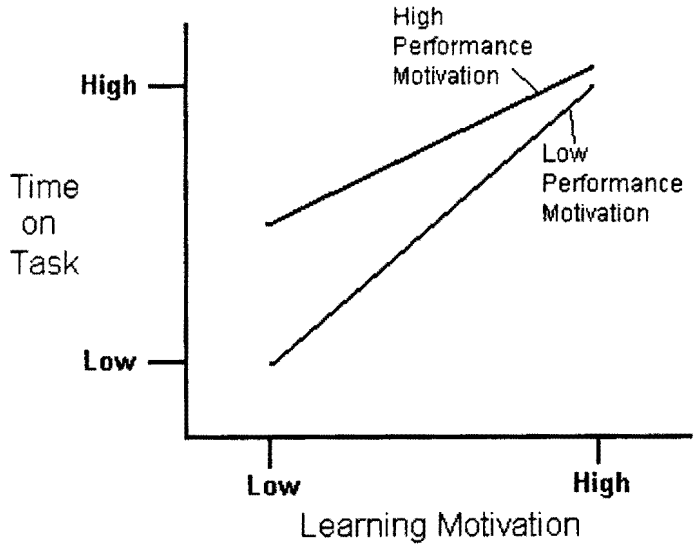


Figure 3: The interaction between learning motivation and performance motivation on time-on-task

For Hypothesis 3, consider the hypothetical qualitative difference between learning and performance motivated individuals. The latter are expected to have much less enjoyable internal feelings when faced with difficulty, even though their time-on-task and objective measures of learning are similar. But even if an individual is learning motivated, being uncomfortable with technology could make the challenges of on-task activities appear higher than the skills available. In this case, learning individuals would not experience flow.

Hypothesis 3: The results of flow can be predicted from the interaction of motivation orientation and comfort with technology such that:

- As the conditions for flow increase, the results of flow increase.
- Low learning motivation scores are associated with low levels of the four results of flow for on-task activities, regardless of performance motivation or comfort with technology. High comfort/high learning scores are associated with high levels of the four results of flow for on-task activities. Low comfort is associated with low levels of the four results of flow for on-task activities, regardless of motivation orientation (see Figure 4).

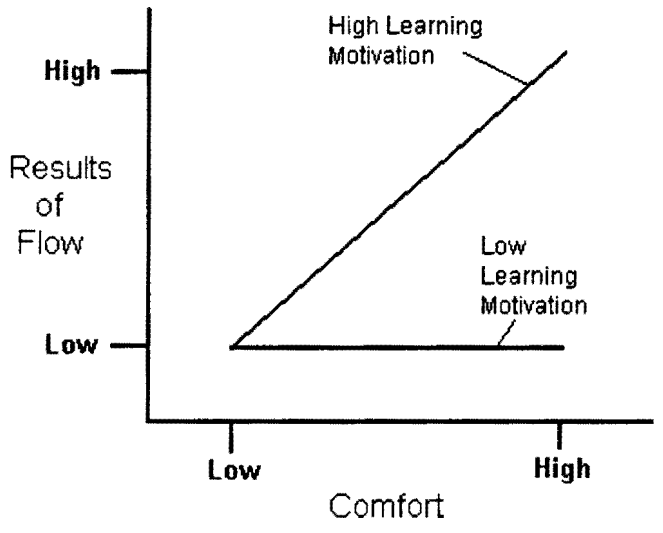


Figure 4: The interaction between learning motivation orientation and comfort with technology on results of flow

As discussed earlier, high learning and high performance motivation orientations are associated with high scores on objective examinations; however, it is thought that high learning motivation may lead to slightly higher test scores than high performance motivation due to the intrinsic value and interest students have in the subject. In addition, time-on-task is shown to be the best predictor of objective learning (Astin, 1993). This leads to Hypothesis 4:

Hypothesis 4: Controlling for comfort with technology, time-on-task, and the interaction of comfort with technology, learning motivation orientation and performance motivation orientation will predict scores on common exam questions such that:

- As time-on-task increases, scores on common exam questions increase.
- There is an interaction between performance and learning motivation on scores of objective learning: high scores on learning motivation, regardless of performance orientation, are associated with high scores on objective measures of learning; low learning/high performance scores are associated with medium scores on objective measures of learning; and low learning/low performance orientations are associated with low scores on objective measures of learning (see Figure 5).

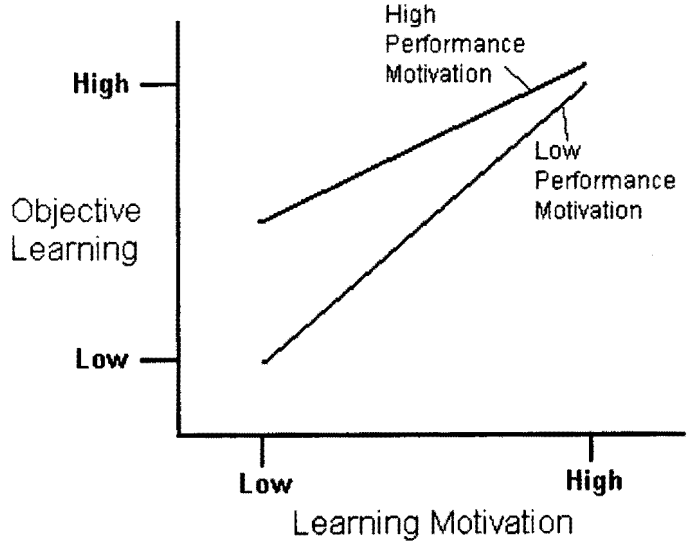


Figure 5: The interaction between performance motivation and learning motivation on objective learning

These hypotheses will be tested on data currently being collected as part of the FIPSE project mentioned earlier. Only a portion of the larger project's data will be used: technology-enhancement, time-on-task, comfort with computers, and a course confidence rating. In addition, new data is being collected.

Parent Study

The data from the parent study came from a federally funded project sponsored by the United State's Department of Education's Fund to Improve Post-Secondary Education (FIPSE). The FIPSE project is a three-year study designed to 1) improve students' experiences in large classes; 2) establish an infrastructure that helps to implement technology, including faculty and curricular development; and, 3) evaluate the effectiveness of educational technology on student learning and cost efficiency (Perrin & Rueter, 1995).

Faculty participation is for two years. The first year consisted of a week-long summer workshop in which 14 Portland State University faculty members transformed their classes into multi-media presentations using PowerPoint, simulations, and other similar technologies. In the second year, faculty integrated web-based technology in the form of a web-site containing tutorials, pre-enrollment quizzes, e-mail, lecture notes, the syllabus, and the course schedule.

In the first year, participating faculty taught 3,502 students (Ostrogorsky, 1997). Traditionally-taught control courses were matched with technology-enhanced

experimental courses; sometimes the instructors in both courses were the same. Pre- and post-course surveys were administered to all participants during the first and last weeks of the quarter. See Appendix B for the surveys. This survey gathered demographics, attitudes toward technology, previous computer experience, motivation, confidence, and satisfaction with the course. Student records provide students' current GPA, identifies students who fail to complete the course, and provide students' course grade. In addition, control and experimental instructors agreed on common exam questions to allow comparison between the two groups.

Time-on-task Sub-Study

This study examines the hypotheses mentioned earlier by selecting a sub-sample of volunteer students from six courses. Using the Experience Sampling Method, these students carried two-way pagers for approximately eight days in order to discover their amount of time-on-task. In addition, new questionnaires about motivation orientation and flow were administered. The use of two-way pagers has special considerations for the ESM.

This study approaches ESM in a novel way. New technology development created two-way pagers, signaling devices which have the ability to both receive and send messages. Replies can be received via e-mail or another two-way pager. In this way, participants can respond with a pre-determined code for the activities they are participating in, rather than filling out questionnaires.

The two-way pager is about 3 times the size of a regular pager. At 3 1/2 x 2 1/2 x 1 in., it seems like a mix between a cellular phone and a standard pager. With a 2 1/2 x 1 in. screen and "Game-boy"-type control pad, users can create and scroll through folders of addresses, sent and received messages, and pager preferences. The full range of a standard keyboard's keys can be used with the control pad. Alerts can be vibrations, standard "beeps", specialized tones, or even small bits of music such as Beethoven's 9th symphony or Amazing Grace. One particularly relevant function is the vibration of the pager about fifteen seconds before it emits a sound; this allow participants to stop the pager before interrupting others, while preserving the ability to make itself known if it is not felt. The pager requires one AA battery, which lasts about two weeks. Signals are programmed for future delivery, using software provided through the pager company. Random times are chosen, then entered into the software program, along with a e-mail address for replies. This e-mail address is not displayed to the pager user, who only selects "reply to" and cannot use this e-mail address in any way. The random times are sent into the pager company's computer via modem. The company stores the message for future delivery. When delivered, if signals are not received, the service stores the messages until the signal is received or until three days have past.

Performing ESM using a two-way pager has additional benefits. A commonly reported problem with traditional ESM studies is participant's delay in response to the

signal because of the inconvenience of filling out a questionnaire. The two-way pager's hand-held size and in-unit response capability makes it less distinguishing and easier to mask in many situations; hopefully this will decrease the time between signal and response. However, the most distinctive benefit of the two-way pager is its ability to send e-mail responses. These can be saved into a file; using a simple computer program designed by Lynnae Sutton of the FIPSE team enables the extraction and placement of relevant data into an Excel or SPSS data file. Hence, there is no data entry; participants play the role of research assistant and enter the data themselves. Another beneficial aspect of two-way pagers is the ability to store messages and report the time signals were sent. If a participant misses a page, he can check the time the page was received to remember what he was doing at that time.

Two major drawbacks that particularly apply to ESM using two-way pagers are the size and price of the pager. The relatively heavy weight of the two way pager may encourage participants to set it down when at home or sitting down. Missed signals and lost pagers may be the unfortunate result. Also, as there is only one company selling and renting the two-way pagers, the cost is rather high. As the technology becomes more widely available the cost will inevitably drop, making this kind of study more possible.

Method

Subjects

Approximately 40 participants were recruited (19 experimental, 21 control). The sample size was much smaller than expected due to a number of factors outside of the researcher's control. These included: 1) Loss of pager service due to a satellite malfunction for a one-week period; 2) Participant's loss and breakage of two pagers; and 3) Participant no-shows. Students from both traditional and technology-enhanced Human Development. Biology, and Geography classes voluntarily signed up for participation. Five beepers were available; therefore, up to five students at a time could volunteer. Random selection procedures were used to decide the participants. During Winter term Biology and Human Development courses were taught with technological enhancement and Geography and Biology courses were taught traditionally. In Spring term, the traditional Human Development course was taught by the instructor who taught the course in Winter. Technologically-enhanced and traditional Biology and Geography courses were taught with different instructors, Winter and Spring.

Materials

Two-way beepers were used to assess students' time-on-task during an eight-day period. A coding sheet attached to the beepers specifies the categories to which the

participants' use of time should correspond (see Appendix C for the categories). The categories are fairly broad and rather impersonal, with an emphasis on academics. Responses to the pages were received automatically into an e-mail account.

Time-on-task was a continuous variable representing a percentage of effort expended throughout the week on the activities. It was computed by the following formula:

- Time-on-task = $\{([(P_{T1} \times P_{E1}) + (P_{T2} \times P_{E2}) + (P_{T3} \times P_{E3}) \ldots] + [(S_{T1} \times S_{E1}) + (S_{T2} \times S_{E2}) + (S_{T3} \times S_{E3}) \ldots]) / (\text{total effort for all activities})\} * 100$, where P_{T1} = primary activity at time 1, S_{T1} = secondary activity at time 1, P_{E1} = amount of effort in primary activity at time 1, and S_{E1} = amount of effort in secondary activity at time 1.
    - On-task activities = 1, all others = 0.

Measuring the eight aspects of flow was accomplished by a questionnaire administered upon return of the pagers asking how the participants felt, during the week in which they carried the pager, about eleven of the activities on the coding sheet. These questions were taken from Csikszentmihalyi and Csikszentmihalyi (1988).

The four conditions of flow were measured by the questionnaire shown in Appendix D. These are: 1. The balance of challenges and skills; 2. Clarity of goals; 3. Clarity of feedback; and, 4. The sense of control. Because this thesis examines on-

task activities, only the responses to "Studying for 'this class'", "Computer work for 'this class'", and "Attending 'this class'" were considered when measuring flow; in this way, twelve scores from each participant's flow questionnaire were examined.

The balance of challenges and skills was measured by comparing the participant's challenge and skill level for on-task activities to his or her average challenge and skill level. If the challenges and skills were in balance or close to balanced and higher than the average challenge and skill level for the week, the participant fulfilled this condition for flow (see Figure 1 above). This was measured by the following equations, where C = challenge score and S = skill score:

- First, the mean challenge score and standard deviation, and the mean skill score and standard deviation was computed for each participant over the eleven activities listed in Appendix D.
- Second, the pooled standard deviation was computed by:

$$\sqrt{\frac{Sd_C^2 + Sd_S^2}{2}}$$

- Third, if (C - the mean of X_C) ≤ 0 or (S - the mean of X_S) ≤ 0, then Balance = 0
- Else:
    - if $|C - S| > 1$ pooled standard deviation, then Balance = 0
    - if $|C - S| \leq 1$ pooled standard deviation, then Balance = 1

Clear goals, clear feedback, and the sense of control were measured on 10-point ordinal scales as shown in Appendix D; for each, the individual increasingly fulfilled a condition for flow as their score increased.

For the results of flow, action and awareness, concentration, and self-consciousness were measured on a 10-point scale. For concentration, the merging of action and awareness, and the transformation of time, flow increased as the score increased. For self-consciousness, flow increased as the score decreased.

To measure motivation goals, a 8-item questionnaire based on one used previously (Miller et al., 1993; see Appendix E) was administered to students on the day they received their beepers. This questionnaire measures achievement goal tendencies on two levels: students that want to learn for the sake of learning (learning-goal), and students that want to learn in order to get good grades and avoid social rejection (performance-goal). Questions regarding performance goals are marked with a "P" and questions regarding learning goals are marked with a "L".

Learning motivation was measured by summing the responses to questions 1, 4, 5, and 7 to the motivation questionnaire. Performance motivation was measured by summing the responses to questions 2, 3, 6, and 8 to the motivation questionnaire. Learning motivation and performance motivation were reverse scored, so they increased as scores increased. These are both continuous variables.

Comfort with technology was measured by summing the responses to questions 1 through 18 on the pre-course questionnaire; questions 3, 7, 9, 11, 13, and 17 were reversed scored prior to summing. Comfort with technology increased as the summed score increases.

For objective measures of learning, common exam questions for the two Biology courses, the two Human Development courses, and the two Geography courses were compared.

Comfort with technology was measured by using the questions on the fourth page of the pre-course questionnaire. These are listed in Appendix F.

Classification of courses with respect to technology was a dichotomous variable differentiating courses that implemented course web pages and multi-media presentations and control courses taught in the traditional format.

Objective learning was computed by the percentage of common exam questions which were answered correctly.

Procedure

As part of the parent study, participants filled out a pre-and post- course survey administered during the first and last week of classes. In addition, student's answers to the common exam questions were gathered from the class. Participants for this sub-study were pulled from those students who completed the pre-course survey.

Students were approached during the first week of classes on the same date in which they completed the pre-course survey. They were informed about this study and asked to sign up for participation. Random selection procedures were used to pull ten names from each class to contact in order to set up a training session. A thirty minute training session took place first in which participants were given an Informed Consent form, information about the nature of the study, and instructions on how to use the beepers. They also completed a short questionnaire measuring motivation orientation. Each student who completed the study, responding to at least 80% of the prompts, was given a $25.00 gift certificate redeemable at the Portland State University Bookstore. In addition, all students responding to 100% of the beeps, within one and a half hours of receiving the signal (except for the first and last signal of the day, as participants might be asleep), were entered into a drawing to determine the winner of an additional $25.00 gift certificate.

Participants were beeped at random eight times a day, between the hours of 7 AM until 11 PM, with the stipulation that they would not be beeped more than once per two-hour block. When the participant was beeped, he or she responded by keying in the corresponding code for the primary and secondary activities performed within the last ten minutes, as well as a code from one to six describing the amount of effort invested into each activity. The amount of effort of both activities together could not exceed six.

Upon return of the pagers, participants filled out a three page questionnaire measuring the eight aspects of flow in eleven of the activities they had engaged in over the previous week, and wrote any comments or criticisms.

Results

Prior to analysis, all variables were examined through SPSS for missing values and violations of the assumptions of multivariate normality. Means and standard deviations are shown in Table 3; missing values were replaced with the mean in all analyses. Values were missing in seven cases on the variable of automatic action for attending class and the variable of automatic action for studying for class, for a total of less than 2% of the data points.

Variable	Mean	Standard Deviation	Range
Learning goals	11.57	3.99	4 - 18
Performance goals	6.42	3.60	4 - 18
Control, attending	6.83	2.27	0 - 9
Goal clarity, attending	7.60	1.61	4 - 9
Feedback clarity, attending	6.45	2.11	0 - 9
Balance, attending	.18	.38	0 - 1
Concentration, attending	6.33	2.19	0 - 9
Time perception, attending	4.20	1.62	1 - 7
Automatic action, attending	6.90	1.97	0 - 9
Self-consciousness, attending	3.30	3.00	0 - 9
Control, studying	7.15	1.18	3 - 9
Goal clarity, studying	7.60	1.82	2 - 9
Feedback clarity, studying	6.67	1.82	1 - 9
Balance, studying	.23	.42	0 - 1
Concentration, studying	6.60	2.06	1 - 9
Time perception, studying	4.48	1.55	1 - 7
Automatic action, studying	6.18	1.86	3 - 9
Self-consciousness, studying	3.08	3.07	0 - 9
Time-on-task, attending	2.67	1.96	0 - 7.35
Time-on-task, studying	3.68	4.29	0 -16.26
Quartiled time-on-task, att.	2.50	1.13	1 - 4
Quartiled time-on-task, study	2.48	1.15	1 - 4
% Correct Common Exam Q's	76.94	18.62	42.86 - 100

Table 3: Means and standard deviations for all variables.

Variables concerning computer work were dropped due to non-normality and low response rates. Very few subjects responded that they were doing computer work when they were beeped. Twenty-four of the forty participants never engaged in this activity and most others engaged in it rarely--only four participants performed

computer work for more than 3% of their total time-on-task. Other variables such as feelings of control for computer work and clarity of goals for computer work were heavily skewed and showed very little improvement with transformations. For these reasons, variables concerning computer work for the class were omitted from the study. The other two activities considered in this study, attending class and studying for class, were kept separate in all analyses because of the qualitative differences between the activities. It was believed that important aspects of the variables would be lost if they were combined, thereby limiting the understanding of the underlying processes. This belief gained support in the data, as each activity had different indicators, discussed below.

The conditions for flow and results of flow were also not combined, due to the same reasoning as above. While the variables in these aggregate terms were often correlated, or demonstrated some multicollinearity, it was not considered great enough to warrant combinative use of the variables (see the intercorrelations between the flow variables, Table 4 and Table 5).

	Conditions of Flow				Results of Flow			
	Bal.	Cont.	Goal	Feed.	Conc.	Self-Cons.	Auto-Act.	Time
Bal.	1.000							
Cont.	-.023	1.000						
Goals	.074	.420**	1.000					
Feedbk	.185	.481**	.581**	1.000				
Conc.	.113	.326*	.481**	.556**	1.000			
Self-Cons.	.198	.046	.322*	.327*	.149	1.000		
Auto-Actions	-.028	.370*	.047	.066	-.037	.125	1.000	
Time Perc.	.189	.295	.463**	.190	.321*	.193	.161	1.000

** $p < 0.01$
* $p < 0.05$

Table 4: Attending class--intercorrelations between the flow variables.

	Conditions of Flow				Results of Flow			
	Bal	Cont	Goal	Feedbk.	Conc.	Self-Cons.	Auto-Act.	Time
Bal	1.000							
Cont	.089	1.000						
Goals	.186	.019	1.000					
Feed	.235	.011	.518**	1.000				
Conc.	.194	.148	.400*	.460**	1.000			
Self-Cons.	.263	.086	.336*	.215	.041	1.000		
Auto-Actions	-.120	.072	-.018	.067	.001	-.349*	1.000	
Time Perc.	.106	.139	.159	.228	.366*	.057	-.147	1.000

** $p < 0.01$
* $p < 0.05$

Table 5: Studying for class--intercorrelations between the flow variables.

With the exception of the time-on-task data and the variables mentioned above, all variables fit assumptions of normality. Time-on-task data was heavily skewed with many participants reporting zero time for studying or attending class. To improve the distribution of time-on-task data, these variables were divided into quartiles (see Table 6). Finally, reliability tests were ran on the motivation questionnaire and both parts were found to be reliable (Learning Cronbach's α=.96, Performance Cronbach's α=.76).

	Attending	Studying
Group 1	0 - 1.06%	0 - 0%
Group 2	1.06 - 2.80%	0.1 - 2.08%
Group 3	2.80 - 3.93%	2.08 - 5.31%
Group 4	3.93 - 7.35%	5.31 - 16.26%

Table 6: Quartile ranges for percentages of time-on-task attending class and studying for class.

Hypothesis 1

Two MANOVA's were used to test Hypothesis 1, which stated: " Higher reported levels of the four conditions for flow in on-task activities will be seen in technology-enhanced courses when compared to traditionally taught courses." The first analysis used the four conditions of flow for studying as the dependent variables and technology classification as the independent variable. The overall Wilkes' Λ=.917, was not significant, $F_{(4, 35)}$=.795, p=.536. The second analysis used the four conditions of flow for attending class as the dependent variables and technology classification as

the independent variable. The overall Wilkes' Λ=.897, was also not significant, $F_{(4,34)}$=1.17, p=.340. Means and standard deviations for the four conditions of flow, split by experimental classification, are shown in Table 7; these groups were not significantly different on any of the variables.

Variable	Technology-enhanced		Control	
	Mean	Std. Dev.	Mean	Std. Dev
Attending class				
Control	7.046	2.214	6.556	2.382
Goal clarity	7.500	1.655	7.722	1.602
Feedback clarity	6.318	2.255	6.611	1.975
Balance	.090	.294	.278	.460
Studying for class				
Control	7.227	1.926	7.056	1.697
Goal clarity	7.181	2.107	8.111	1.278
Feedback clarity	6.546	2.064	6.823	1.550
Balance	.136	.351	.333	.485

Table 7: Hypothesis 1--means and standard deviations for the four conditions of flow, by experimental classification.

Hypothesis 2

Hypothesis 2 stated: "The four conditions of flow, comfort with technology, and the interaction of learning and performance motivation orientation will predict time-on-task such that:

- As the four conditions of flow increase for on-task activities, time-on-task increases.
- As comfort increases, time-on-task increases.

- There is an interaction between performance and learning motivation on time-on-task: high performance/high learning motivation and low performance/high learning motivation are associated with high time-on-task; high performance/low learning motivation is associated with medium time-on-task; low performance/low learning motivation is associated with low time-on-task (see Figure 3)."

Upon further consideration of our hypothesis, comfort with technology was dropped from analysis because of its theoretical mismatch with half of the data set; technology had no relevance to the control group. Thus, this variable would have not been predictive for the control group and would have added notable error variance to the analysis, and the sample size was not large enough to include additional interaction terms.

Two simultaneous multiple linear regressions were used to test Hypothesis 2. The first used quartiled time-on-task for attending class as the dependent variable and learning motivation, performance motivation, learning x performance motivation, and the four conditions of flow as the independent variables. The second analysis used the same independent variables and time on task for studying as the dependent variable. For the first analysis, with attending class as the dependent variable, the interaction term of learning x performance was not significant (R^2=.339, $F_{(7, 32)}$=2.340, p=.048);

hence it was dropped from the analysis and the multiple linear regression was re-run without the interaction variable.

The model without the interaction variable was significant, R^2=.326 , $F_{(6, 33)}$=2.661, p=.032. Table 8 displays the unstandardized regression coefficients (B), the standardized regression coefficients (β), the t-value and significance level, and R^2.

	b	β	t	p
Learning goals	.05	.17	1.08	.290
Performance goals	-.06	.21	1.39	.175
Feedback, attending	-.20	-.38	-1.83	.077
Goal clarity, attending	.36	.51	2.82	.008
Control, attending	.01	.03	.15	.881
Balance, attending	.91	.31	2.09	.044

R^2=.326, $F_{(6,33)}$=2.661, p=.032

Table 8: Hypothesis 2, attending class--standardized and unstandardized regression coefficients, t-values, significance levels, and R^2.

The unique contribution of clear goals while attending class (β=.510, t=2.82, p=.008) and the balance of challenges and skills for attending class (β=.308, t=2.091, p=.044) were significant. Both of these relationships are positive, signifying that as the clarity of goals and/or the balance of challenges and skills for attending class increase, time-on-task for attending class increases. All other variables did not exhibit significant unique contributions. Table 9 summarizes the zero-order correlations between the variables. As with the regression, only clarity of goals and balance between challenges and skills were significant.

	Quartiled Time Attending Class
Learning goals	.173
Performance goals	.236
Feedback clarity, attending	.086
Goal clarity, attending	.351*
Control, attending	.065
Balance, attending	.324*

* $p <= .05$

Table 9: Attending class--zero-order correlations between the four conditions for flow, motivation orientation, and quartiled time-on-task.

The second simultaneous multiple linear regression for Hypothesis 2 used quartiled time-on-task studying for class as the dependent variable and learning goals, performance goals, their interaction, and the four conditions of flow while studying as the independent variables. The R^2 for this model was .282, $F_{(7, 32)}=1.794$, p=.123. As above, the interaction variable of learning x performance goals was dropped due to non-significance and the model re-run.

The model without the interaction variable was not significant, $R^2=.276$, $F_{(6, 33)}=2.093$, p=.081. Since the analysis lacked statistical power due to the small sample size and large number of independent variables, zero-order correlations were examined, see Table 10. Learning goals and clear feedback were shown to be significantly correlated with quartiled time-on-task for studying (r=.418, p=.004 and r=.326, p=.02, respectively). As learning goals increased, the amount of time-on-task

for studying increased (motivational goals are negatively scored). As the clarity of feedback increased, time spent studying also increased.

	Quartiled Time-on-task Studying for Class
Learning goals	.418*
Performance goals	.173
Feedback clarity, studying	.326*
Goal clarity, studying	.141
Control, studying	.223
Balance of challenges/skills, studying	-.014

* p <= .05

Table 10: Studying for class--zero-order correlations between the four conditions for flow, motivation orientation, and quartiled time-on-task.

Hypothesis 3

Hypothesis 3 read: "The results of flow can be predicted from the conditions of flow and the interaction of motivation orientation and comfort with technology such that:

- As the conditions for flow increase, the results of flow increase.
- Low learning motivation scores are associated with low levels of the four results of flow for on-task activities, regardless of performance motivation or comfort with technology. High comfort/high learning scores are associated with high levels of the four results of flow for on-task activities. Low comfort is associated with low levels of the four results of flow for on-task activities, regardless of motivation orientation (see Figure 4)."

As in Hypothesis 2, the comfort with technology variable was dropped due to its addition of error variance into the analysis. Eight sets of analyses are presented. In each, discussion concerns the significance of the linear regression and, if appropriate, further examination of the β's. The last part of each set of analyses is an examination of the zero-order correlations. This is warranted due to a small sample size and subsequent low power of the multiple linear regressions. Four of the eight regressions included learning motivation, performance motivation, and the four conditions of flow for attending class as the independent variables. The four results of flow for attending class were the dependent variables. The remaining four regressions included learning motivation, performance motivation, and the four conditions of flow for studying for class as the independent variables and each of the four results of flow for studying for class as individual dependent variables. Table 11 summarizes the R^2 for the eight analyses.

Dependent Variable	R^2	$F_{(6,33)}$	p
Attending class			
Concentration	.478	5.033	.001
Time Perception	.287	2.210	.067
Self-consciousness	.208	1.440	.229
Automatic Action	.172	1.146	.358
Studying for class			
Concentration	.494	5.364	.001
Time Perception	.105	.646	.693
Self-consciousness	.218	1.530	.198
Automatic Action	.061	.360	.899

Table 11: Hypothesis 3--R^2, F-values, and significance levels for the eight linear regressions.

Attending class--the four results of flow

For the first of the eight regressions, with concentration while attending class as the dependent variable, the regression was significant, R^2=.478, $F_{(6, 33)}$=5.033, p=.001. Examination of the β's (see Table 12) revealed that learning motivation was the only significant variable (β=-.392, t=-2.818, p=.008); however, clarity of goals approached significance. Examining the zero-order and partial correlations, there is evidence for multicollinearity, which is expected if the four independent variables are truly conditions of a larger factor, flow.

	b	β	t	p
Learning goals	.22	.39	2.82	.008
Performance goals	.07	.01	.09	.928
Feedback, attending	.22	.21	1.16	.256
Goal clarity, attending	.40	.30	1.86	.072
Control, attending	.09	.10	.64	.529
Balance, attending	-.06	-.01	-.09	.931

R^2 = .478, $F_{(6,33)}$ = 5.03, p = .001

Table 12: Hypothesis 3, concentration while attending class--standardized and unstandardized regression coefficients, t-values, significance levels, and R^2.

Zero-order correlations demonstrated that as scores on learning goals increased, concentration increased, r=.481, p=.001 (see Table 13). As scores on sense of control increased, concentration increased, r=.326, p=.020. Clarity of goals also had a positive relationship with concentration, r=.556, p<.001.

Variable	Concentration, attending	Time Per., attending	Self-Con., attending	Automatic actions, att.
Learning goals	.481*	.021	-.004	.123
Perf. goals	.161	-.015	.166	.103
Control, attending	.326*	.295*	.046	.344*
Goal clarity, attending	.481*	.463*	.322*	.043
Feedback, attending	.556*	.190	.327*	.058
Balance, attending	.113	.189	.198	-.022

* $p <= .05$

Table 13: Attending class--zero-order correlations between variables.

For the second analysis, using time perception while attending class as the dependent variable, the linear regression approached but did not reach significance (R^2=.287, $F_{(6, 33)}$=2.21, p=.067); however, zero-order correlations showed that as clarity of goals increased, time seemed to pass faster (r=.463, p=.001) and as the sense of control increases, time seemed to pass faster (r=.295, p=.032), see Table 13.

For the third analysis, using self-consciousness while attending class as the dependent variable, the linear regression was not significant (R^2=.208, $F_{(6, 33)}$=1.44, p=.229). In the zero-order correlations, as clarity of goals increased, self-consciousness increased (r=.322, p=.021) and as the clarity of feedback increased, self-consciousness increased (r=.327, p=.020), see Table 13.

In the fourth analysis, the blending of action and awareness, or automatic action while attending class, was the dependent variable. The linear regression was

not significant (R^2=.172, $F_{(6, 33)}$=1.146, p=.358). Sense of control was the only significant variable in the zero-order correlation (r=.344, p=.015).

Studying for class--the four results of flow

The fifth analysis for Hypothesis 3 examined concentration while studying as the dependent variable. The linear regression was significant (R^2=.494, $F_{(6, 33)}$=5.364, p=.001), see Table 14.

	b	β	t	p
Learning goals	.218	.422	3.023	.005
Performance goals	.166	.289	2.066	.047
Feedback, studying	.082	.072	.449	.657
Goal Clarity, studying	.301	.266	1.785	.083
Control, studying	.074	.065	.507	.615
Balance, studying	-.285	-.058	-.440	.663

R^2 = .494, $F_{(6,33)}$ = 5.36, p = .001

Table 14: Hypothesis 3, concentration while studying for class--standardized and unstandardized regression coefficients, t-values, significance levels, and R^2.

Further examination revealed that both learning goals and performance goals had significant regression coefficients (β=.422, t=-3.023, p=.005, and β=.289, t=-2.066, p=.047, respectively). As the participant's learning goals and/or performance goals increase, their concentration increases; learning goals had a stronger association. While no other variables were significant in the linear regression, examining the zero-order correlations disclosed significant correlations of goal clarity (r=.400, p=.005) and clarity of feedback (r=.452, p=.002) with concentration, see Table 15. As each of these variables increased, concentration while studying increased.

Variables	Conc., studying	Time Per., studying	Self-Con., studying	Auto. actions, studying
Learning goals	.575*	.266*	-.054	.147
Perf. goals	.394*	.110	.155	.115
Control, studying	.148	.139	.086	.067
Goal clarity, studying	.400*	.159	.336*	-.107
Feedback, studying	.452*	.227	.212	.060
Balance, studying	.194	.106	.263*	-.017

* $p <= .05$

Table 15: Studying for class--zero-order correlations between variables.

The perception of time while studying was used as the dependent variable in the sixth analysis. The linear regression was not significant, R^2=.105, $F_{(6, 33)}$=.646, p=.693. The zero-order correlations showed only one significant variable, learning motivation, r=.266, p=.049, see Table 15.

Self-consciousness while studying was employed as the dependent variable in the seventh analysis. The overall linear regression was not significant, R^2=.218, $F_{(6, 33)}$=1.53, p=.198. For the zero-order correlations, as the balance of challenges and skills increased, self-consciousness increased (r=.263, p=.05), and as the clarity of goals increased, self-consciousness increased (r=.336, p=.017), see Table 15.

The final dependent variable for Hypothesis 3 was automatic actions for studying. The linear regression was not significant (R^2=.061, $F_{(6, 33)}$=36, p=.899). No zero-order correlations were significant.

Hypothesis 4

Hypothesis 4 read: "Controlling for comfort with technology, time-on-task, and the interaction of comfort with technology, learning motivation orientation and performance motivation orientation will predict scores on common exam questions such that:

- As time-on-task increases, scores on common exam questions increase.
- There is an interaction between performance and learning motivation on scores of objective learning: high scores on learning motivation, regardless of performance orientation, are associated with high scores on objective measures of learning; low learning/high performance scores are associated with medium scores on objective measures of learning; and low learning/low performance orientations are associated with low scores on objective measures of learning (see Figure 5)."

As discussed in earlier analyses, comfort was dropped due to its inapplicability to the control group. Because of confusion between participating instructors, half of the data set was unusable in this analysis, leaving a sample size of 21. A linear regression was used with percent of correct common exam questions as the dependent variable and quartiled time-on-task attending, quartiled time-on-task studying, learning motivation, performance motivation, and the interaction of learning x performance motivation as

the independent variables. This analysis was not significant (R^2=.222, $F_{(5, 15)}$=.858, p=.531), so the interaction term was dropped and the model re-run. This analysis was also not significant (R^2=.215, $F_{(4, 16)}$=1.094, p=.393). None of the zero-order correlations were significant.

Discussion

Overview

The many analyses can be broken into two sets, one for attending class and one or studying for class. To ease understanding of the myriad findings, they are summarized below. For attending class:

- There were no differences between technology-enhanced and control courses on conditions for flow.
- Clear goals and the balance of challenges and skills were positively related with time-on-task.
- Learning motivation was positively related with concentration.
- Time-on-task and learning motivation were not related to objective learning, but this had a very small sample size.

For studying for class:

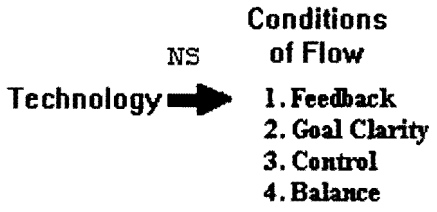
- Again, there were no differences between technology-enhanced and control courses on conditions for flow.
- Learning motivation and feedback clarity were positively related to time-on-task.

- Learning motivation and performance motivation were positively related to concentration.
- Again, time-on-task and learning motivation were not related to objective learning, but this had a very small sample size.

The results of this study add to a growing literature on the experiential aspects of intrinsic motivation, indicating that there are characteristics of a deeply motivated state (flow), which are associated with time and effort spent performing a task. However, there were no differences on the conditions of flow between participants in technology-enhanced courses and control courses. This study also found that motivational goal orientation--the cognitive reasons for performing an action--are related to both the act and the feeling experienced during the act. When motivated by learning goals, not only does time-on-task for studying increase, but participants report deeper concentration and time seems to move faster. When motivated by performance goals, only concentration while studying increases, and this is at a weaker level than with learning goals.

Technology and Flow

For the first part of our model, we proposed that students in technology-enhanced courses would show greater levels of the four conditions for flow (see Figure 6); results showed no differences between the groups.



NS: Not Significant

Figure 6: Attending class and studying for class--Findings for technology's influence on the conditions for flow

However, this does not necessarily mean that flow cannot be encouraged through technology. As mentioned earlier, technology is simply a tool, ultimately it is the instructor's use of the technology which could create or inhibit a foundation for flow. Quotes from the post-course questionnaire describe this more accurately: "[I didn't like the] lack of interaction--yet [the teacher] did a great job instructing in this environment. Applause to [the teacher's] teaching skills, not so much the technology. Without good teachers, technology is pointless!" Or perhaps more appropriately: "Often the instructor... could not make the technology work. It really broke up the flow of learning."

Technology also seems to bring heightened discomfort to many people. Wrote one respondent, "I don't like and am not familiar with computers"; this attitude definitely makes course technology non-conducive to a feeling of control! However, technology-enhanced classes may have not been different than control courses because of a problem in the research design: no extremely large classrooms were low-tech. There is a possible confound between technology and class size, though we found no

differences between larger and smaller classes on the flow variables. Qualitatively, however, some students in very large classes may feel out of control: "The class size was overwhelming. Because the class was so big, completed tests were handed back in a non-discrete manner. Students were able to see my grade and I did not like that." Another mentions the sense of a lack of feedback in a large classroom: "[Technology] made for a bigger class size, less personal, less discussion.... It seems a convenient way to cram 300 students in one classroom. No homework, no papers."

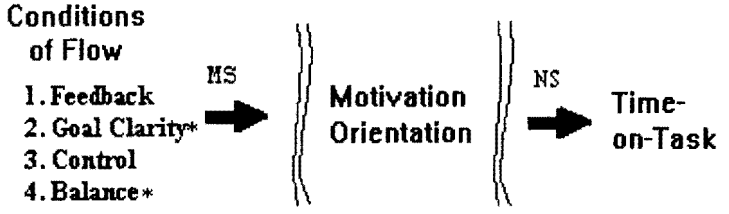
However, technology also appeared to have some positive aspects in the open-ended responses of students. For instance, even though goal clarity was not found to be significant, participants seemed to repeatedly reference the clarity of goals in technology classes: "[I liked] being able to pull lecture notes off the Internet before class. This helped me decide what to focus on in the reading," and, "[I liked] having the notes beforehand--off the web. One can spend more time listening rather than trying to organize and remember what has been said." These quotes demonstrate how students might feel more in control and competent through one aspect of technology. This is supported by other research showing that the building of competence and autonomy, or the understanding of how to influence outcomes and the ability to do it, leads to increased success in the classroom (Ryan & Grolnick, 1986).

Further work in this direction should focus on creating truly comparable technology-enhanced and non-technology classes, similar in every manner, including

teacher, room, and course requirements, excepting technology use. In addition, comparable courses could be taught with and without the use of the Internet to isolate the influence of interactive technology as separate from classroom technology. In any case, the use of technology should be treated as a tool for achieving the four conditions of flow and not as a way to bypass quality teaching.

Motivation, Flow, and Time-on-Task

The second part of the model proposed that a high learning motivation orientation and high scores on the conditions for flow were related to high time-on-task had mixed support from the data. High goal clarity and the perception of balanced challenges and skills were correlated with increased classroom attendance (see Figure 7).



MS: Mixed Significance
NS: Not Significant

Figure 7: Attending class--Relationships between motivational-goal orientation, the conditions for flow, and time-on-task.

Most interesting were the findings that high challenge level in the classroom may motivate students to attend class and not an "easy A". This argument had considerable support from previous research on building intrinsic motivation and competence

through optimal challenges (Deci & Ryan, 1985; Deci et al., 1991). Providing optimal challenges leads to increased intrinsic motivation, itself leading to increased time-on-task.

Hypothesis 2 gained further support in that learning motivation, and not performance motivation, was associated with high time-on-task for studying (see Figure 8); however, the predicted interaction between the motivation orientations did not surface.

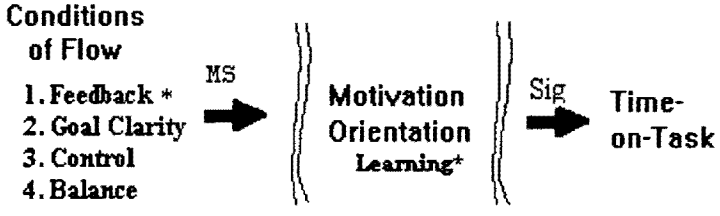


Figure 8: Studying for class--Relationships between motivational-goal orientation, the conditions for flow, and time-on-task.

The importance of learning motivation over performance motivation fits with the research of Schraw and his colleagues , who found that learning orientation "facilitates the development of cognitive skills necessary to increase academic achievement, independent of one's performance orientation" (1985, p. 359). Dweck's (1986) prediction of an interaction has only received mixed support in the literature; when an interaction is not found, it is often in research with characteristics similar to this study. For instance, Miller et al. (1993), explained that the failure to find a significant interaction in their study was due to low power because of a small sample size. As in

our study, Miller and his colleagues had very few participants who had high performance motivation and low learning motivation. Table 16 shows the low frequency of students with a high performance motivation and low learning motivation, where "High" and "Low" are divided by the variable's mean.

	Performance		
Learning		**Low**	**High**
	Low	11	5
	High	8	15

Table 16: Number of participants scoring high and low on performance and learning-goal motivation.

Regardless of the lack of an interaction, the finding fits with research on intrinsic motivation, in that time spent performing an action increases as the intrinsic value of that action increases, in this case, learning (Deci & Ryan, 1985). In addition, clarity of feedback was also shown to be associated with high time-on-task for studying; research on intrinsic motivation argues that feedback provides a support for competence in the individual, one of the "three innate needs" of self-determination theory (Deci et al., 1991).

Examining these findings, the question becomes: Why is it that the balance of challenges and skills and the clarity of goals is related to attending class, and the clarity of feedback that is related to studying? A possible solution lies in self-determination theory (Deci & Ryan, 1985). This theory argues that support for competence (i.e. optimal challenges, feedback, clear goals) facilitates intrinsic motivation, but only when it is accompanied by support for autonomy (i.e. is non-

controlling). This support for autonomy is based on the functional significance of the situation; it is not necessarily the actual event, but the way the student perceives the event, that affects motivation. And expectations affect perceptions in dramatic ways.

Studying is a student-driven activity requiring greater self-motivation and autonomy than attending class. Feedback on progress may be perceived as autonomy-supportive as it is not an imposition but a contribution to the student's self-directed progress. Perhaps the student thinks, "You can tell me what to do in the classroom, but not at home."

A learning-goal motivation may significantly affect time-on-task studying for exactly the same reason. As studying is expected to be student-driven, it is the highly self-motivated student who would spend more time and energy on this activity. Attending class is dependent upon other, "noisier" aspects, including the teacher's personality and teaching style, characteristics of the room, the time of day, and the student's relationship with other students. As well as this, it makes functional sense that clear goals are not related to time spent studying: students should be more focused in a course with clear goals. Students with no clear direction about what to study will spend time studying different material, information that is not related to the instructor's goals. In this way, students with clear goals for studying may be spending equal amounts of higher-quality time studying. Obviously, this is speculative and

more research needs to be done to pick out the important qualitative differences between studying and attending class.

The fact that so few of the aspects of flow were found to be associated with time-on-task was somewhat surprising. This may have been due to the low sample size, or the relatively low variance of the time-on-task data, or other distributional abnormalities. Also suspect is the fact that flow has not been fully reified and concretized in the literature. Csikszentmihalyi, in fact, argues that flow is an abstraction which often shares eight aspects, but many people do not experience flow in all of the eight ways discussed. For this reason and others, he argues against the complete reification or definition of flow; because flow is an abstract state, once it has been defined as a certain score on a questionnaire we have mistaken the reflection for the reality (1992). Taking this into context, the multicollinearity of the flow variables in this study is impressive.

Establishing flow in the course

The hypothesis that high scores on learning motivation, comfort with technology, and the conditions for flow were related to high scores on the results of flow also had mixed support in the data. The predicted interaction between comfort with technology and motivation orientation was not tested due to the comfort variable's inapplicability to the low-tech control group. Of all the tasks studied,

comfort with technology was most applicable to information regarding computer work for the class, which was unfortunately discarded from the data set due to low response.

For an overview of this part of the model for both attending and studying for class, see Figure 9. Regarding attendance of class, learning goals were associated with only one result of flow, concentration. As predicted, performance goals had no relationship to any of the results of flow. It appeared that, consistent with Dweck's theory, learning-motivated students experience higher-quality learning (Miller et al., 1993). Learning-goal motivated students employ greater cognitive strategies and self-regulatory processes while mastering material, hence their greater concentration (Meece & Holt, 1993). By encouraging and reinforcing student's beliefs that course material is to be valued for intrinsic reasons, instructors may be able to increase concentration in the classroom.

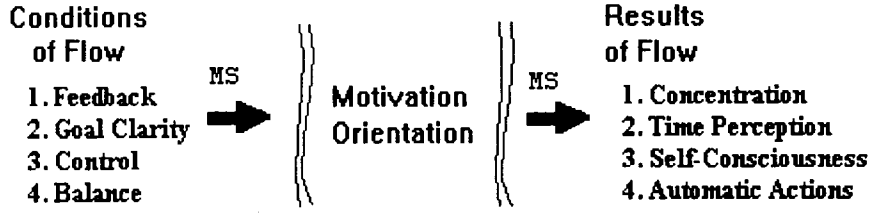


Figure 9: Attending and studying for class--Relationships between motivational-goal orientation, the conditions for flow, and the results of flow.

Several of the conditions for flow demonstrated the predicted relationship with the variables for results of flow (see Table 17). The sense of control was related to increased concentration, time seeming to pass more quickly, and a heightened sense of

automatic actions. Goal clarity was associated with increased concentration and time passing quickly. Clear feedback was related to increased concentration. Through providing clear and structured goals and feedback, and a feeling of control, instructors may be able to increase classroom concentration, dissolve the student into their actions, and make the hour seem to quickly advance.

However, clear goals and feedback for attending class both had a relationship with self-consciousness that was opposite the predicted relationship. This may have been due to the confusion many participants had surrounding the self-consciousness variable. Participants would often be confused by the question, "For each of the following activities, how self-conscious were you?," with several participants essentially asking the researcher if self-consciousness was to be construed positively or negatively. Again, the lack of a complete reification of flow creates difficulty in measurement.

	Results of Flow			
	Concen.	**Time Perception**	**Self-Con.**	**Automatic Actions**
Control	.326	.295		.344
Goal Clarity	.481	.463	.322	
Feedback Clarity	.556		.327	
Balance				

Table 17: Attending class--significant zero-order correlations between the conditions for and results of flow.

For studying for class, both learning goals and performance goals were correlated with concentration, but as predicted in both self-determination theory and motivational goal theory, learning goals had a stronger correlation. A high learning goal motivation was associated with the perception that time was moving faster. As with attending class, being intrinsically (learning) motivated is related to a higher-quality, more flow-like experience

Clear goals and feedback were also correlated with concentration while studying; as with attending class, by encouraging the development of an innate enjoyment of coursework, and providing clear goals and feedback, instructors may be able to increase student's concentration and speed up the perception of time while studying. Again, the interrelations point towards acceptance of flow as an underlying factor, for an overview of the significant correlations see Table 18. Self-consciousness was positively correlated with both goal clarity and the balance of challenges and skills, which is the reverse of what was expected. Again, this may have occurred because of participants' confusion surrounding the self-consciousness variable.

	Results of Flow			
	Concen.	**Time Perception**	**Self-Con.**	**Automatic Actions**
Control				
Goal Clarity	.400		.336	
Feedback Clarity	.452			
Balance			.263	

Table 18: Studying for class--significant zero-order correlations between the conditions for and results of flow.

Time-on-Task, Motivation, and Objective Learning

Hypothesis 4 proposed that high scores on a set of common exam questions were related to high scores on time-on-task for both studying and attending class, and being highly learning motivated. It also proposed an interaction between learning and performance motivation (see Figure 10).

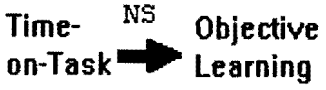


Figure 10: Attending and studying for class--The findings for the relationship between time-on-task and objective learning.

No aspect of this hypothesis was shown to be true. This was very surprising, as a great deal of literature on time-on-task (Astin, 1993) and motivation (Dweck, 1986; Benaware & Deci, 1984; Lloyd & Barenblatt, 1984) strongly supported this hypothesis. However, the confusion surrounding instructor's implementation of the common exam question, and the subsequent loss of nearly half of the data set, may have decreased the power enough to prevent detection of any relationships.

In an attempt to more fully understand the model, an exploratory follow-up analysis examined the zero-order correlations between the results of flow for both studying and attending class and the objective learning scores. Only one variable had a significant correlation, concentration while attending class ($r=.417$, $p=.038$). As concentration increased, the percentage of correctly answered common exam questions

increased. Combined with the other findings, this suggests that instructors could increase test scores by increasing the sense of control, goal clarity, and feedback clarity in the classroom.

Model Summary

The overall model received mixed support from the data. While technology was not associated with increasing scores on the conditions for flow, we did find many of the predicted relationships between motivation orientation, components of flow, and time-on-task. Figure 11 depicts the overall model for attending class.

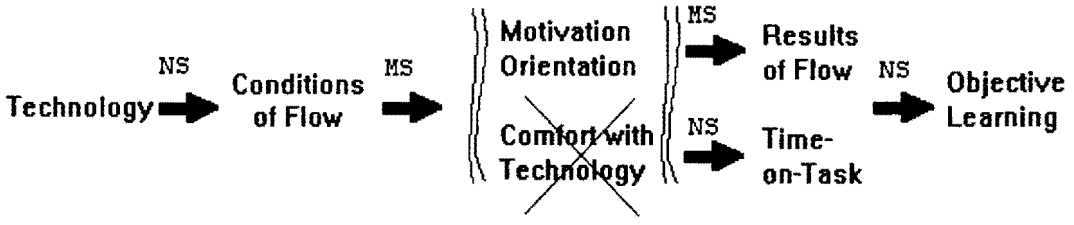
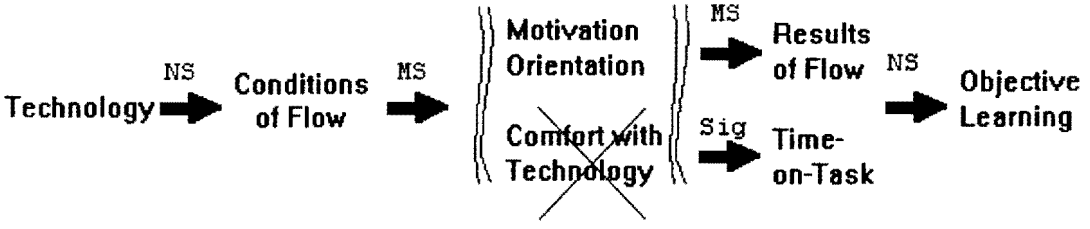


Figure 11: Attending class--overall model.

As can be seen from Figure 11, motivation orientation is related to the results of flow (concentration) while attending class but not to the amount of time-on-task for attending class. This confirms the idea that motivation orientation is related to the intrinsic quality of time spent on that task, with increasing quality, but not necessarily increasing time, for learning-motivated people. Finally, motivation orientation and time-on-task was not related to scores on common exam questions.

Studying for class revealed slightly different results. Figure 12 shows the overall model for studying for class. In this model, as learning motivation increases, time-on-task for studying increases. Along with this, high levels of learning motivation and performance motivation were associated with high concentration, although learning motivation had a stronger correlation. High levels of learning motivation were related to time seeming to pass faster. As with attending class, motivation orientation and time on task was not related to scores on common exam questions.



NS: Not significant
MS: Mixed significance
SIG: Significant at .05 or better

Figure 12: Studying for class--overall model.

While characteristics of studying for class and attending class differ, both models are similar in that perceived conditions for flow, along with a high learning motivation orientation, are related to an intrinsically higher-quality experience.

Implications

The findings of this study support they idea that an effective way to encourage students to participate fully in a course (attending and studying) is to appeal to their

intrinsic motivation by stimulating them with challenging information, clear goals, and clear feedback on their progress in the course. Course technology, just like any other teaching tool, could be used effectively to enhance the quality of a course or ineffectively as a hindrance to learning.

Students must be encouraged to develop a love of learning. Providing students with optimal challenges, clear goals and feedback, and control over their studies advances competence and autonomy, pushing them to be their best. Ribbons, certificates, and money cannot compete with the satisfaction of accomplishing a challenge, because it is a natural extension of life to enjoy learning, to push the edge of knowledge.

Unfortunately, many students have been trained to perceive school as a place to jump through hoops. This study showed that simply providing challenging material encourages students to attend class while supporting the intrinsic value of class. The advancement of technology is creating increasingly sophisticated and flexible tools for providing those challenges for both student and instructor, creating a higher-quality and memorable experience for everyone.

Our study found that a class which balances challenges with student's skills may encourage students to attend class more often; once the students are there, the provision of clear goals, clear feedback, and a sense of control may support increased concentration, a merging of action and awareness, and a class period so enjoyable that

it seems to rush by. And, as the exploratory analysis showed, this increased concentration may result in higher test scores. Just as flow theory predicts, a more complex individual results form this process. A hypothetical model is detailed in Figure 13. It portrays the combinative results of this research; a learning loop, with aspects of flow in the classroom, blends with student motivation to create deeper understanding of course material. In this way, the aspects of flow work together to both get the students in the door and make it worth everyone's energy.

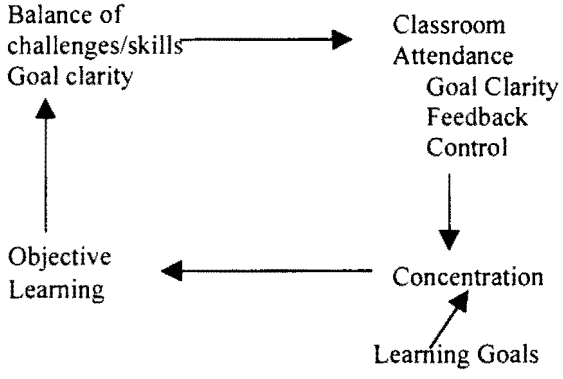


Figure 13: Hypothetical model for future research.

Aspects of technology easily provide solutions to the problem of how to accomplish these goals. Pre-course self-assessment quizzes, taken over the Internet, allow the student to select out of classes he is not prepared for (matching challenges to skills) and provide feedback to the instructor on the skill level of her class. Class notes, syllabus, and tutorials available 24 hours a day could provide the clear goals, clear feedback, and a strong sense of control over the course that is associated with higher-quality learning.

Working with students to encourage a love of learning begins a transformation of attitudes and actions, a development of a learning motivation which is both healthy and effective. Acquiring this desire to learn increases the chances that a student will enter the deeply motivated state of flow, where participation in class and understanding of coursework reaches their highest level.

Strengths of the Study

The overwhelming strength of this study lies in its ecological validity. The use of real teachers, undergoing real development, teaching real students, with a measurement tool allowing precise collection of the real lives (the pager), is a fantastic exploration of life outside of the laboratory. The relative anonymity of using the pager, as opposed to being observed by a scientist in a white coat, provided an externally valid glimpse into the lives of ordinary students.

The inclusion of flow theory in the study allowed examination of the aspects of quality experience which may be overlooked in other studies. As mentioned previously, it is not necessarily more time on classwork that should be encouraged; rather, encouragement should be for better time on classwork. Flow theory provided a theoretically structured manner of examining the quality of experience.

Limitations of the Study

There are several limitations to the research design of this study; the first involves the lack of a true control group. This study used four instructors for six

courses; different instructors have different teaching styles and methods, areas of emphasis, test difficulties, and many other differences, all areas which affect student motivation and achievement in a much larger way than the use of a web page or PowerPoint presentation. Without the use of a true control group, that is, an instructor who is blind to the expectations of the research, well-versed in technology in teaching, flexible enough to work in two formats, and who teaches in the same room from class to class, it will be difficult, if not impossible, to discern any true differences in student motivation and achievement from the use of technology. Indeed, as mentioned earlier, simply the size of the room has an impact on student's appreciation of the class.

The lack of this true control group created further problems, most notoriously the "common exam question". This thesis intended to examine objective student learning by comparing scores on four or five identical questions on tests in control and experimental classes. However, confusion between instructors was rampant; common exam questions were changed, dropped, and tallied incorrectly, greatly limiting the scope of this study.

One interesting solution suggested by a member of the FIPSE team would be the use of teaching "units", or week-long blocks of one general topic. In this way, units could be randomly assigned high-tech or low-tech, and the instructor could teach accordingly. The next term in which the course is taught, the units would alternate. While this approach would be relatively difficult to employ, it would provide an

easier-to-implement alternative to ours. Also useful about this idea is a simplification of the common exam question, a frequent stumbling block during our research.

The second limitation to the research design is the dual implementation of technology and assessment. As mentioned previously, instructors involved in our study were trained simultaneously on Classroom Assessment Techniques and the use of technology, but altering two variables concurrently restrains causal understandings. Future research should avoid this confusion.

Much of the research in this study was correlational in nature; therefore, causation cannot be determined. As well as this, some of the correlations may have been present because of participant response style. For instance, learning goals may have been correlated to higher quality experience because particular participants may have been more susceptible to effects of social desirability, or making themselves appear to be a "good student".

Also, one of the "control" courses actually used a scaled-down course web site which included lecture outlines but not on-line grades. This course used overhead transparency slides of PowerPoint presentations rather than the actual computer-generated graphics. While a blend of high-tech and low-tech is inevitable in almost any modern course, the use of this particular course as a "control" in our study may have reduced the power of the research to detect differences between technology and control courses.

Another imperfection is a research method that is relatively new--the use of two-way pagers. Because there is no literature on studies using this exact method, replication rates, validation, etc., cannot be determined. A major weakness of using the two-way pager is the lack of available open-ended responses. Even though only three tasks studied, the amount of time-on-task for school activities was extremely low for most of our sample; several participants were never paged while studying or attending class. By increasing the frequency of pages, this problem may be avoided in the future.

The limited depth of response allowed by two-way pagers created difficulty in gathering responses to the flow questions throughout the week. To solve this problem, we presented participants with the flow questionnaire as a summary at the end of the week. Using this method, a great deal of the quality of experience was lost, as participants may have simply forgotten the challenge of their coursework. Similarly, there were problems with some of the questions on the flow questionnaire; specifically, participants were often confused by the measure of self-consciousness, with several asking the researcher what was meant or implied by the word "self-consciousness". It is thought that this confusion contributed to the findings of this research that were opposite of those expected. For future research to test this aspect of the theory, the question should be re-written. Finally, the sample size was small; with only 40 participants (18 control and 22 experimental) there was low statistical power.

Future Research

This study showed that there are components of a highly motivated state that are correlated with motivational goal orientation. However, the findings were not clear in several areas due to the limitations of the study. Future research should sort through the many threads of this study to more accurately define the process. This research needs to:

1. Increase the sample size to ensure sufficient power, as well as sufficient members of certain groups (i.e. high performance-goal motivated participants).

2. Employ strict management of experimental and control groups, including the strict use of common exam questions.

3. Re-evaluate the measures of flow, especially the variable of self-consciousness.

4. Give participants a small notebook to allow the collection of qualitative data which is otherwise unavailable through the week.

5. Page participants more often to achieve a higher sample size of activities, and allow responses to the "flow questions" after each page.

6. Evaluate flow relative to other activities-- Are student's in flow while studying more or less often than other activities, and does this relate at all to their success in the course?

7. Finally, for exploratory reasons, the future researcher may want to examine whether instructor's feelings of flow while teaching are related to student's feelings of flow.

With these alterations, a more accurate picture of the qualitative effects of motivation should emerge, depicting the student who is deeply motivated as having a higher-quality, more enjoyable, and increasingly memorable experience.

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Appendix A

Example of a Course Web Site

PORTLAND STATE UNIVERSITY

SOCIOLOGY 339 Syllabus

Soc339
Lectures

Links
Feedback
Grades
Site Map
Pre-Quiz

Collier's Home

PSU
Sociology

Required Work:

There will be two 50 questions exams:	You need to bring:	The test format will be:
• one mid-term, • a final exam.	• Scantron 882 from • a number 2 pencil to each exam	• "true false" • multiple choice

- There will be two writing assignments- one during each half of the course. Both will be based on the "Opposing viewpoints" material. Each will be worth 10 points.
- Over the course of this class, two guest speakers will come to make presentations. You must write a one-page, typewritten, double-spaced, no more than one inch margins- top, bottom, left, right, reaction paper on one of these presentations. This paper is worth 5 points.
  - The reaction paper written on speaker #1 is due by January 30th.
  - The reaction paper written on speaker #2 is due by March 9th.

Final Exam:

- 3-16-98, 12:30
- Chapter 9 - 16
- Articles from the second writing assignments.

Grading Scale:

Grade	%	Points		Grade	%	Points
A	93	116		C	70	88
A-	90	112		C-	66	82
B+	86	108		D+	63	79
B	83	104		D	60	75
-B	79	99		D-	57	71
C+	75	94				
Total Points: 125						

Misses Exams:

If an emergency prevents you from taking an exam, please notify the Sociology office (725-3926) as soon as possible. No early exams. Makeup exams only under extreme circumstances. All students must take the final exam.

Writing assignments:

There will be two writing assignments- one during each half of the course. Both will be based on the "Opposing viewpoints" material.

Assignment #1: What is the Status of the Family?'
Due by January 30th

- Read the preface, and Viewpoints #1, #2 , & # 3
- From the beginning of each article, Answer the following:
  -
  - Article #1 questions 2 & 3
  - Article #2: questions 2 & 3
  - Article #3: questions 1 & 2
  - (1 point each = 6 points total)
- In no more the two sentences, summarize each of the put forth in these articles. (3 points)
- What is your positions on the "status of the family'? (1pts)

Assignment #2: "How does Divorce Affect the Family"/
Due by March 9th.

- Read Viewpoints #1, & #2
- From the beginning of each article, answer the following:
  -
  - Article #1: questions 1, 2, & 3
  - Article #2: questions 1, 2, & 3
- In no more than two sentences, summarize each of he positions put forth in these articles. (3 points)
- What is your positions on "the affect of divorce on the family"? (1pts)

Bonus Work:

There are two possible sources o extra-credit in this class. First, you may write a one-page, typewritten, double-spaced, no more than one inch margins- top, bottom, left, right, reaction paper on the second guest presentations. This paper is worth 5 extra-credit points.

- The reaction paper written on speaker #1 is due by January 30th.
- The reaction paper written on speaker #2 is due by March 9th.

Second, there are 9 weekly feedback questions (each worth .5 pt) which you may answer via e-mail through the class website, or by picking up a copy of the feedback question from outside my TA's office, 217-E Cramer Hall. Feedback questions will be made available each week on Monday and are due at the TA's office on Friday s by the end of class.

Important information

Notes concerning Writing Assignments and bonus work:

1. All papers are to be typed or computer printed. Handwritten papers will not be accepted.

2. Please pay attentions to deadlines for turning in wiring assignments and bonus

work. Late papers will be marked down as follows:

# of days late	Writing assignments	Reactions paper
1	-3	-1
2	-4	-2
3-4	-5	-3
5 or grater	Papers will not be accepted	

3. All papers need to checked and corrected for spelling errors, and grammatically correct. Please answer writing assignment questions in complete sentences. If you require assistance in this area, the PSU writing lab, 133 CH can help. Papers with high numbers of spelling and grammatical errors will be penalized 50% of assignment grade.

4. Keep a copy of all papers you write for this course.

IMPORTANT NOTE: Based on past experience, not every student is clear as to the expectations associated with this course. In order to make sure that you understand the levels of skills and quality of work necessary to achieve the grade that you want in this class, we recommend that you take the anonymous pre-test we have developed. You can follow this link to the Pre-Quiz

Classroom Behavior:

In an effort to make this class a learning experience for everyone, please be considerate of the other students in class. Do not play Walkmans, or other radio / tape players in the class (event with headphones). Also, if you wish to carry on conversations with you friends, please do so outside of class, not during the lecture. If these or other types of distracting behavior persists, the students involved will be asked to leave the class.


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Contact Peter Collier. Site constructed by Chris Miller for the PSU's FIPSE Project coordinated by Nancy Perrin and John Rueter. © 1997. Last updated on October 5, 1997. For more see the About Page.

PORTLAND STATE UNIVERSITY

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PSU Sociology

Lecture Outline for Sociology 339 Winter 1998

Week	Day	Topics	Assignments
1	Monday 1/5	Syllabus Introduction	• Pre-Enrollment quiz • Chapter 1, & 2 • (Kain) Quiz on Family Myths • Feedback 1 • Feedback 2
	Wednesday 1/7	Introduction Life Choices	
	Friday 1/9	Life Choices Family	
2	Monday 1/12	Family	• Chapter 2, & 3 • Feedback 3
	Wednesday 1/14	Gender	
	Friday 1/16	Speaker (tenative)	
3	Monday 1/19	Holiday	• Chapter 4
	Wednesday 1/21	Gender	
	Friday 1/23	Love	
4	Monday 1/26	Sexuality	• Chapter 5, & 6 • Feedback 4 • First writing assignment and first reaction paper due Friday 1-30
	Wednesday 1/28	Sexuality	
	Friday 1/30	Singles	
5	Monday 2/2	Choosing Partners	• Chapter 7, & 8 • Feedback 5 • Review Chapter 1-8, • Review first writing assignment
	Wednesday 2/4	Choosing Partners Marriage	
	Friday 2/6	Marriage	

6	Monday 2/9	Mid-Term	• Chapter 9, & 10 • Feedback 6
	Wednesday 2/11	Communication	
	Friday 2/13	Communication Having Kids	
7	Monday 2/16	Having Kids	• Chapter 11, 12, & 13 • Feedback 7
	Wednesday 2/18	Raising Kids	
	Friday 2/20	Raising Kids Work	
8	Monday 2/23	Work	• Chapter 10, 13, & 14 • Feedback 8 *2/27 Last day to drop a class*
	Wednesday 2/25	Power	
	Friday 2/27	Speaker (tenative)	
9	Monday 3/2	Marital Fighting	• Chapter 14, & 15 • Feedback 9
	Wednesday 3/4	Marital Fighting	
	Friday 3/6	Divorce	
10	Monday 3/9	Divorce	• Chapter 15, & 16 • second writing assignment and second reaction papeer due Monday 3-9
	Wednesday 3/11	Remarriage	
	Friday 3/13	Remarriage	
11			• Review Chapter 9, & 16 • Articles for second writing assignment
	Final Exam Monday March 16, 12:30pm		

Important Information

These Lecture Notes are not intended to be a complete presentation of the course content They are designed as an outline for the materials presented in lecture. Additional materials are in the text, and are presented during class. Many sentences are incomplete and we use our own sociology shorthand. You may copy these note to your own computer or print.

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PORTLAND STATE UNIVERSITY

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PSU
Sociology

Course Information:

- Sections: 001
- CRN: 43181
- Class Time: MWF 12:45 - 13:50
- Class Location: Harrison Hall

Click on map

Harrison Hall

Instructor:

- Peter Collier
- Office: 217-0 Chi
- Office Hours: MW 10:30 - 11:30, or by arrangement.
- Phone: 725-396, I prefer to be contacted by phone
- Email: peter@ch1.ch.pdx.edu

Teaching Assistant:

- Name: Wendy Wehage
- Office: 217-E Cramer Hall
- Office Hours: Hours: MF 1330 - 1430
- Phone: I prefer to be contacted by e-mail
- Email: psu13035@odin.cc.pdx.edu

Textbook:

- Required: Lamanna & Reidmann : *MARRIAGES AND FAMILIES* 6th Edition
- Supplemental pamphlets: Pamphlets are the same as Chapters #1 and #2 of the book *FAMILY IN AMERICA: OPPOSING VIEWPOINTS*
  - 1."What is the Status of the Family?"
  - 2."How does Divorce Affect the Family?"
- Texts are available at the Portland State University Bookstore.
- A copy of each text is also on reserve at the PSU library.

Course Objectives:

This course is about life events and challenges that everyone of us has or will have to deal with. Among the topics we will cover are love, sex, dating marriage, divorce, remarriage, domestic violence, work, and parenting. This is not a "how-to" course; instead we examine what we know about these various topics, particularly from a sociological perspective.

The class will move rather rapidly through a number of topics and chapters. there will be considerable reading for this course. The lectures will not merely summarize the text, and students are responsible for keeping up in the different texts. This will be a lecture-style class (given the size), however discussion, questions, and comments are welcome.

Computer Support at PSU

Getting an email account at PSU:

- PSU keeps all student email accounts on a computer called 'Odin'. To sign up for you personal Odin account go to Shattuck Hall Room 120 (see map.) Bring your PSU ID or proof of admittance such as your class list.

Free workshops:

- PSU holds free workshops on popular software such as browsing the Internet using Netscape, Word processing with Microsoft Word, and how to use your Odin email account. Contact the OIT help desk at 725-HELP for the workshop schedule.

PSU Computer Labs

• Library (20 Mac & 20 PC Systems) • Shattuck Hall 107 & 112 (20 Mac & 20 PC Systems) • Library: Access Center for the Disabled • For location, see map.	Monday	7:30am-10:00pm
	Tuesday	7:30am-10:00pm
	Wednesday	7:30am-10:00pm
	Thursday	7:30am-10:00pm
	Friday	7:30am-5:00pm
	Saturday & Sunday	Closed

Syllabus:

- Course objectives, Required Work, Grading scale
- Schedules listed in the course syllabus are subject to change during the term. Change will be announced in class.

Lecture Outline:

- Links to lecture notes.
- Links to online quizzes
- Schedules listed in this course are subject to change during the term. Change will be announced in class.

Course Links:

- Links to related subjects.
- Add your own link to this page.
- Other Resources
    - Other Universities and Colleges, Libraries, Bookstores and Magazines, Technology Companies,

Assessment / Feedback:

- Quizzes, test, and other assessment techniques.

Grades:

- Your grades in this course.

Site Map:

- Graphic outline of this site.

Pre-Enrollment Quiz:

- Please take this Pre-enrolment quiz the first week of class.

Important Information:

- Americans with Disabilities Act Notice If you are entitled to accommodations under the Americans with Disabilities Act, please inform your instructor early in the term.

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PORTLAND STATE UNIVERSITY

SOCIOLOGY 339
Pre-assessment Quiz

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PSU Sociology

INSTRUCTIONS:

Please complete the following questions and then press the Submit Answers button at the bottom of the page.

Enter your name and PIN:

First name: [ ] Last name: [ ]
PIN (last four digits of your SSN): [ ]

AREA I - VOCABULARY

Because this class involves outside reading, knowing that you have the appropriate skill level of vocabulary for this course is important.

Which phrase BEST describes the following words?

Question 1: commitment

- ○ a. a group of people whose job is to consider or act on some matter.
- ○ b. the promise or agreement to do something in the future
- ○ c. collective ownership of property
- ○ d. to work together on a project
- ○ e. don't know

Question 2: emphasize

- ○ a. to stress the importance of a point
- ○ b. a tall bird that cannot fly
- ○ c. to leave your place of residence to live in another country
- ○ d. to make beautiful through ornamentation
- ○ e. don't know

Question 3: traditional

- ○ a. based on inherited patterns of thought or action
- ○ b. highly sensitive or irritable
- ○ c. having an interesting flavor

○ d. capable of being taught
○ e. don't know

AREA II - FUNDAMENTAL MATH SKILLS

Because this class relies heavily upon research of family studies scientists, a basic understanding of elementary math and statistics is important.

MEASURES OF CENTRAL TENDENCY

Question 4: Nine students take a 10 point Sociology quiz. The range of scores is: 9, 8, 8, 8, 6, 5, 4, 4, 2. What is the:

MEAN: [ ] MODE: [ ] MEDIAN: [ ]

Question 5: What best describes the following relationship?

"the hotter the daily temperature, the greater the amount of ice cream eaten"

○ a. temperature and ice cream consumption are positively correlated
○ b. temperature and ice cream consumption are negatively correlated
○ c. hot temperatures cause increased ice cream consumption
○ d. eating more ice cream causes temperature to increase
○ e. don't know

AREA III - READING COMPREHENSION

Because of the large amount of outside reading required in this course, it is important that you be able to understand the key points of different assignments. Read each of the following excerpts and answer the accompanying questions.

"In defining the family, judges have used the criteria of common residence and economic interdependency and the more intangible qualities of stability and commitment." *(from Marriage and Families, Lamanna & Reidmann 1997: 6)*

Question 6: Which of the following factors did judges use in determining "what is a family"? (select any that apply)

☐ a. the members live together
☐ b. the members worship together
☐ c. the members travel together

☐ d. the members support each other financially
☐ e. don't know

Question 7: Which of the following factors, used in defining the family, were identified as "less concrete" or "harder to measure directly"? (select any that apply)

☐ a. common residence
☐ b. economic interdependence
☐ c. stability
☐ d. commitment

"During the 1970s, educational and medical authorities vigorously promoted contraception, abortion, and sterilization. They argued that these technologies would strengthen the family by allowing married couples to regulate their fertility so that all their children would be wanted and would arrive when they wanted them." (from "The brave new world of reproductive technology" DeMarco, 1990, in What is the Status of the Family, D. Bender (Ed.) 1992:80)

Question 8: Which of the following was / were part of the program to promote reproductive technology in the 1970s? (select any that apply)

☐ a. made for television movies
☐ b. birth control
☐ c. medically operating on men and women so that they could no longer have children
☐ d. closing drive-in movies
☐ e. don't know

Question 9: How were the identified reproductive technologies supposed to strengthen the family? (select any that apply)

☐ a. by reducing unwanted pregnancies
☐ b. by allowing couples who wanted to have children to control when these pregnancies occurred
☐ c. by improving mothers' health during pregnancy
☐ d. by improving babies' health after delivery
☐ e. don't know

AREA IV - WRITING SKILLS; GRAMMAR AND SENTENCE STRUCTURE

Because there will be several required writing assignments associated with this course, it is important that you have certain fundamental writing skills.

"All people make choices, even when they are not aware of it. One effect of taking a course in marriage and family may be to make you more aware of when choices are available and of how a decision may be related to subsequent option and choices, so that you can make decisions more knowledgeably." (from "Marriage and Families, Lamanna & Reidmann 1977: 15-16)

Select the BEST answer, in terms of grammar and sentence structure, for the following question.

Question 10: What is one effect of taking a course in marriage and family?

- ○ a. So that you can make decisions knowledgeably.
- ○ b. One effect is so you can make decisions more knowledgeably.
- ○ c. One effect are so you can make decisions more knowledgeably.
- ○ d. One effect is so you can make decisions more knowledgeable.
- ○ e. don't know

WRITING SAMPLE

"The increase in immigrant families has led policy makers and others to consider many issues...(One) issue is whether, on balance, immigrant families are an asset or a liability to the nation's economy...It appears that immigrant families pay more in payroll, property, and ales taxes than they cost the government in public services. However, controversy rages because most immigrant family tax dollars go to the federal government while the costs of their schooling or health care are largely paid for by local governments."
(from "Marriage and Families, Lamanna & Reidmann 1977: 14)

Question 11: In the space provided below, what is your position on this issue – "Are immigrant families an asset or a liability to the nation's economy?" Defend your position.

Question 11:

Press [Submit Answers] to see the results of your quiz.

Press [Clear] to start over.

CGI programming and Quiz form by N. Lynnae Sutton for the PSU FIPSE Project Coordinated by Nancy Perrin and John Rueter. 1997. Content by Peter Collier. Site by Chris Miller.

Appendix B

Pre- and Post- Course Survey

Fund for the Improvement of Postsecondary Education (FIPSE)
Curriculum Revision with Educational Technology:
Improving Student Outcomes in Large Classrooms

Part I

LAST six digits of your social security number:

XXX-___-_____

This will be used to match this survey with the second survey administered at the end of the course.

Once the data has been matched, your identification number will be removed from the data set.

Fund for the Improvement of Postsecondary Education (FIPSE)
Curriculum Revision with Educational Technology:
Improving Student Outcomes in Large Classes

CONSENT TO PARTICIPATE

Thank you for agreeing to participate in this study to assess learning outcomes in the large classroom. You will be asked to provide some general information about yourself, complete two short surveys, one at the beginning of the course, taking about 10-15 minutes to complete, and one at the end of the course, taking about 15-20 minutes to complete. Included in the survey at the end of the course will be a set of evaluation questions. Some of the items on your final exam will be used to assess your learning in this course.

We ask you to put the LAST six digits of your social security number on the front of the packet so that we will be able match your pre- and post-course scores. Once we have matched these scores, your identifying number will be deleted and all analyses will be done without reference to you or any other individual. The information you provide will be kept confidential. Composite information, without reference to any individuals, will only be shared with your instructor after the final grades have been recorded in the Registrar Office.

You will not receive any direct benefit from taking part in the study, but the study may help to increase knowledge that may help others in the future. Nancy Perrin (725-5058) or John Rueter (725-3845), co-investigators for the study, are available to answer any questions you may have about the study or what you are expected to do.

You do not have to participate in this study and if you chose not to do so, it will not affect your course grade or relationship with Portland State University.

By completing the surveys and tests you are implying that you have consented to participate in this study.

If you have any concerns or questions about this study, please contact Vikki Vandiver at (503) 725-5007, Chair of the Human Subjects Research Committee, or the Office of Grants and Contracts, 105 Neuberger Hall, Portland State University, (503) 725-3417.

I-A

Gender	___F ___M	
Age	_____years	
What year are you in school? (Check one)	__ Freshman	__ Masters Student
	__ Sophmore	__ Doctoral Student
	__ Junior	__ Post Graduate
	__ Senior	__ Not enrolled/Not admitted
	__ Post Baccalaureate	__Other:_____
How many credit hours are you taking this term?	___ undergraduate hours	___ graduate hours
Do you have significant child or elder care obligations?	___yes ___no If yes,	___average hrs/wk
Are you a single parent?	___yes ___no	
Are you currently employed?	___yes ___no If yes,	___average hrs/wk
If yes, do you use a computer in your work?	___yes ___no If yes,	___ % of time
Do you own a computer?	___yes ___no	
If no, do you have have easy access to one?	___yes ___no	
What types of operating systems have you worked on? (Check any that apply)	__ Macintosh	__ Unix
	__ DOS/IBM	__ VMS
	__ Windows/IBM	__ Other:_____
How have you used a computer? (Check any that apply)	__Word processing	__Spreadsheet
	__Database	__E-mail
	__Graphics/Presentation	__Internet/WWW
	__Programming	__Simulation
	__Statistical packages	__Games
	__Other:_____	
Do you have an e-mail address?	___yes ___no	
Can (could) you access e-mail from home?	___yes ___no	
Do you have Internet access from home?	___yes ___no	
Have you ever been diagnosed with a learning disability?	___yes ___no	
Did you complete Freshman Inquiry or Transfer Transition?	___yes ___no	

I-B

Please indicate the extent to which you agree or disagree with each of the statements below by marking the number that corresponds to your feelings, opinion, or experience.
1=STRONGLY DISAGREE
2=Moderately Disagree
3=Slightly Disagree
4=Slightly Agree
5=Moderately Agree
6=STRONGLY AGREE

		STRONGLY DISAGREE					STRONGLY AGREE
1	I am sure that I will use a computer in my future occupation.	1	2	3	4	5	6
2	All college students should have some understanding about computers.	1	2	3	4	5	6
3	I get a sinking feeling when I think about trying to use a computer.	1	2	3	4	5	6
4	I like computer problems that I can't understand right away.	1	2	3	4	5	6
5	It is easy for me to understand most technological advances.	1	2	3	4	5	6
6	I enjoy talking with others about computers.	1	2	3	4	5	6
7	I sometimes get nervous just thinking about computers	1	2	3	4	5	6
8	Having a computer always available to me would improve my productivity.	1	2	3	4	5	6
9	I have avoided computers because they are unfamiliar to me.	1	2	3	4	5	6
10	I could get good grades in classes that use computers.	1	2	3	4	5	6
11	I hesitate to use a computer for fear of making mistakes I cannot correct.	1	2	3	4	5	6
12	Computers are valuable educational tools.	1	2	3	4	5	6
13	Most things I can handle okay, but I have trouble working with computers.	1	2	3	4	5	6
14	If a computer problem was left unsolved after class, I would continue to work on it.	1	2	3	4	5	6
15	Using a computer is very easy for me.	1	2	3	4	5	6
16	Once I start working on a computer I find it very hard to stop.	1	2	3	4	5	6
17	Taking a test on a computer would scare me.	1	2	3	4	5	6
18	All college students should understand the role computers play in society.	1	2	3	4	5	6

I-C

Please indicate the extent to which you agree or disagree with each of the statements below by marking the number that corresponds to your feelings, opinion, or experience.
1=STRONGLY DISAGREE
2=Moderately Disagree
3=Slightly Disagree
4=Slightly Agree
5=Moderately Agree
6=STRONGLY AGREE

Note: These questions apply to your experiences IN GENERAL.

		STRONGLY DISAGREE					STRONGLY AGREE
1	I prefer classes that challenge me to those in which I can get an easy grade.	1	2	3	4	5	6
2	I like learning about a variety of subjects.	1	2	3	4	5	6
3	I often spend time exploring an idea from class that I don't need to know for my grade.	1	2	3	4	5	6
4	I can tell for myself if I learned the subject matter regardless of the grade I receive.	1	2	3	4	5	6
5	If I don't understand something in class, I try to figure it out on my own.	1	2	3	4	5	6
6	I like classes where I have to work hard to master the material.	1	2	3	4	5	6
7	I will probably do graduate work after I finish college.	1	2	3	4	5	6

hese questions should be answered in regard to to THIS CLASS specifically.

1	I feel that I will do well in this class.	1	2	3	4	5	6
2	Doing well in this class is important to me.	1	2	3	4	5	6
3	I think I will enjoy studying for this class.	1	2	3	4	5	6
4	I plan to work hard at my homework for this class.	1	2	3	4	5	6
5	I feel confident that I will get a good grade in this class.	1	2	3	4	5	6
6	I am not very interested in this class.	1	2	3	4	5	6
7	I have a high standard for my performance in this class.	1	2	3	4	5	6
8	I think I will enjoy this class.	1	2	3	4	5	6
9	I think I will enjoy doing outside readings and projects for this class.	1	2	3	4	5	6
10	Most of the things I am interested in are not related to this class.	1	2	3	4	5	6
11	It will be important to me to really understand the concep covered in this class.	1	2	3	4	5	6
12	I plan to keep up with my daily classwork.	1	2	3	4	5	6

I-D

Please put a check next to the statement that describes your reason for taking this class.

_____ I am taking it as a general requirement for my degree.

_____ It is in my major or minor field of study.

_____ I am taking it as an elective or because of my interest.

_____ It was the only class available in this time slot.

_____ OTHER

Fund for the Improvement of Postsecondary Education (FIPSE)
Curriculum Revision with Educational Technology:
Improving Student Outcomes in Large Classrooms

Part II

LAST six digits of your social security number:

XXX-__-_____

This will be used to match this survey with the first survey administered at the beginning of the course.

Once the data has been matched, your identification number will be removed from the data set.

Fund for the Improvement of Postsecondary Education (FIPSE)
Curriculum Revision with Educational Technology:
Improving Student Outcomes in Large Classes

CONSENT TO PARTICIPATE

Thank you for agreeing to participate in this study to assess learning outcomes in the large classroom. You will be asked to provide some general information about yourself, complete two short surveys, one at the beginning of the course, taking about 10-15 minutes to complete, and one at the end of the course, taking about 15-20 minutes to complete. Included in the survey at the end of the course will be a set of evaluation questions. Some of the items on your final exam will be used to assess your learning in this course.

We ask you to put the LAST six digits of your social security number on the front of the packet so that we will be able match your pre- and post-course scores. Once we have matched these scores, your identifying number will be deleted and all analyses will be done without reference to you or any other individual. The information you provide will be kept confidential. Composite information, without reference to any individuals, will only be shared with your instructor after the final grades have been recorded in the Registrar Office.

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II-A

Please indicate the extent to which you agree or disagree with each of the statements below by marking the number that corresponds to your feelings, opinion, or experience.
1=STRONGLY DISAGREE
2=Moderately Disagree
3=Slightly Disagree
4=Slightly Agree
5=Moderately Agree
6=STRONGLY AGREE

		STRONGLY DISAGREE					STRONGLY AGREE
1	I am sure that I will use a computer in my future occupation.	1	2	3	4	5	6
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3	I get a sinking feeling when I think about trying to use a computer.	1	2	3	4	5	6
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6	I enjoy talking with others about computers.	1	2	3	4	5	6
7	I sometimes get nervous just thinking about computers	1	2	3	4	5	6
8	Having a computer always available to me would improve my productivity.	1	2	3	4	5	6
9	I have avoided computers because they are unfamiliar to me.	1	2	3	4	5	6
10	I could get good grades in classes that use computers.	1	2	3	4	5	6
11	I hesitate to use a computer for fear of making mistakes I cannot correct.	1	2	3	4	5	6
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17	Taking a test on a computer would scare me.	1	2	3	4	5	6
18	All college students should understand the role computers play in society.	1	2	3	4	5	6

II-B

Please indicate the extent to which you agree or disagree with each of the statements below by marking the number that corresponds to your feelings, opinion, or experience.
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3=Slightly Disagree
4=Slightly Agree
5=Moderately Agree
6=STRONGLY AGREE

Note that these questions should be answered in regard to THIS CLASS specifically.

		STRONGLY DISAGREE					STRONGLY AGREE
1	I feel that I did well in this class.	1	2	3	4	5	6
2	Doing well in this class was important to me.	1	2	3	4	5	6
3	I enjoyed studying for this class.	1	2	3	4	5	6
4	I worked hard at my homework for this class.	1	2	3	4	5	6
5	I feel confident that I got a good grade in this class.	1	2	3	4	5	6
6	I was not very interested in this class.	1	2	3	4	5	6
7	I had a high standard for my performance in this class.	1	2	3	4	5	6
8	I enjoyed this class.	1	2	3	4	5	6
9	I enjoyed doing outside readings for this class.	1	2	3	4	5	6
10	Most of the things I am interested in are not related to this class.	1	2	3	4	5	6
11	It was important to me to really understand the concepts covered in this class.	1	2	3	4	5	6
12	I kept up with my daily classwork.	1	2	3	4	5	6

II-C

Please compare both statements before marking your answer
1=I agree with the statement on the LEFT.
2=I agree (with reservations) with the statement on the left
3=I have no preference for either statement
4=I agree (with reservations) with the statement on the right
5=I agree with the statement on the RIGHT

When reading for this course I tended to concentrate on certain parts and skip over others, going back later if necessary to fill in any gaps or missing links.	1 2 3 4 5	When reading for this course I tended to follow the author's presentation reasonably closely, rather than skipping around a lot.
Generally I preferred to concentrate on one (or very few) aspect(s) of this subject at a time when I was learning about it.	1 2 3 4 5	Generally I preferred to be learning about a number of different aspects of this subject at the same time.
I like to approach a new subject in a broad way, often looking at widely spaced aspects of the subject and seeing how they fit together before going back to fill in any steps I may have missed.	1 2 3 4 5	I like the logical links between different aspects of a new subject to be very close so that when I am learning about a second aspect I can see clearly how it relates to the first aspect.
I like to deal thoroughly with the particular aspect I am working on before going on to others.	1 2 3 4 5	I find it too restrictive to wait until I have thoroughly mastered one aspect of a new subject before going on to study other aspects.

II-D

Please indicate the extent to which you agree or disagree with each of the statements below by marking the number that corresponds to your feelings, opinion, or experience.

1=STRONGLY DISAGREE
2=Moderately Disagree
3=Slightly Disagree
4=Slightly Agree
5=Moderately Agree
6=STRONGLY AGREE

		STRONGLY DISAGREE					STRONGLY AGREE
1	The instructor communicated interest/enthusiasm about the subject.	1	2	3	4	5	6
2	The instructor's presentations were clear and understandable.	1	2	3	4	5	6
3	The instructor encouraged discussion and questions.	1	2	3	4	5	6
4	The various aspects of the course (lectures, readings, etc.) were well integrated.	1	2	3	4	5	6
5	Appropriate attention was devoted to differing opinions and approaches to the subject matter.	1	2	3	4	5	6
6	The instructor's reponses to student's questions were clear.	1	2	3	4	5	6
7	The instructor challenged/encouraged my thinking.	1	2	3	4	5	6
8	The instructor was fully prepared when presenting material.	1	2	3	4	5	6
9	The instructor was knowledgeable and confident about the subject.	1	2	3	4	5	6
10	Course objectives and expectations were made clear.	1	2	3	4	5	6
11	The instructor was fair in grading.	1	2	3	4	5	6
12	The exams covered material emphasized in class.	1	2	3	4	5	6
13	I received useful feedback about my performance.	1	2	3	4	5	6
14	The instructor was genuinely interested in having students learn.	1	2	3	4	5	6
15	The instructor was available to spend extra time with students.	1	2	3	4	5	6
16	I increased my understanding of the subject.	1	2	3	4	5	6
17	The class was a worthwhile learning experience.	1	2	3	4	5	6
18	Feedback from the classroom assessment (non-graded) exercises was valuable to my learning.	1	2	3	4	5	6
19	Because of this class I am more confident that I can reach my academic goals.	1	2	3	4	5	6
20	The classroom assessment (non-graded) exercises clarified how well I understood the material.	1	2	3	4	5	6

II-E

Please indicate the extent to which you agree or disagree with each of the statements below by marking the number that corresponds to your feelings, opinion, or experience.

1=STRONGLY DISAGREE
2=Moderately Disagree
3=Slightly Disagree
4=Slightly Agree
5=Moderately Agree
6=STRONGLY AGREE

		STRONGLY DISAGREE					STRONGLY AGREE
21	Technology enhanced my ability to learn the material.	1	2	3	4	5	6
22	I found the use of multiple multi-media images to be overwhelming.	1	2	3	4	5	6
23	The use of e-mail was valuable to my learning in this course.	1	2	3	4	5	6
24	I spent too much time trying to learn to use the technology.	1	2	3	4	5	6
25	I used technology that I learned in class outside the context of this class.	1	2	3	4	5	6
26	I was at a disadvantage in this class because I do not possess adequate computer skills.	1	2	3	4	5	6
27	Because of technology, I was better able to visualize the ideas and concepts that were taught in the course.	1	2	3	4	5	6
28	The use of Internet was valuable to my learning in this class.	1	2	3	4	5	6
29	Technology created a barrier between the professor and the students.	1	2	3	4	5	6
30	E-mail made it easier for me to ask questions and receive responses from the professor.	1	2	3	4	5	6
31	E-mail helped me communicate with other students in the class about course material.	1	2	3	4	5	6
32	Because of the technology, I spent more time studying for this course than I would have otherwise.	1	2	3	4	5	6
33	The aspect that I found most beneficial about the use of technology was:						
34	The aspect that I found most frustrating about the use of technology was:						

II-F

The following questions refer to the pre-course knowledge assessment. This was an on-line self-assessment that your instructor informed you about during the first week of class.

Please indicate the extent to which you agree or disagree with each of the statements below by marking the number that corresponds to your feelings, opinion, or experience.

1=STRONGLY DISAGREE
2=Moderately Disagree
3=Slightly Disagree
4=Slightly Agree
5=Moderately Agree
6=STRONGLY AGREE

		STRONGLY DISAGREE					STRONGLY AGREE
1	The self assessment was easy to find on the Internet.	1	2	3	4	5	6
2	The self assessment helped me understand what was going to be required of me to succeed in this class.	1	2	3	4	5	6
3	I reviewed my notes and other materials from pre-requesite courses after taking the self assessment.	1	2	3	4	5	6
4	The purpose of the self assessment was unclear to me.	1	2	3	4	5	6
5	The self assessment was useful for me.	1	2	3	4	5	6
6	The self assessment questions were not related to the knowledge required to succeed in this class.	1	2	3	4	5	6
7	The self assessment informed me of potential weaknesses and directed me to resources to improve my knowledge.	1	2	3	4	5	6
8	The self assessment was discouraging for me.	1	2	3	4	5	6
9	I was uncomfortable taking a self assessment over the Web.	1	2	3	4	5	6
10	I used the resources suggested by the self assessment to review concepts for the course.	1	2	3	4	5	6
11	I had difficulty answering the self assessment questions.	1	2	3	4	5	6
12	The self assessment boosted my confidence that I would succeed in this class.	1	2	3	4	5	6

Appendix C

Pager Coding Sheet

TIME USE CODING SHEET

ACTIVITY	EXAMPLES
(a) Attending "this class"	
(b) Studying for "this class"	writing papers, reading, researching
(c) Computer work for "this class"	world wide web assignments, e-mail to the instructor or other students, other computer assignments
(d) Attending "other class"	
(e) Studying for "other class"	writing papers, reading, researching
(f) Computer work for "other class"	world wide web assignments, e-mail to the instructor or other students, other computer assignments
(g) Other school-related activities	Attending a committee, applying for graduate school
(w) Working at paid job	
(t) Travelling	commuting, walking, driving, biking, riding the bus
(h) Household Chores	Household chores, paying bills, etc
(i) Caregiving	unpaid caregiving for parents, children, or others
(j) Other computer activity	personal e-mail, computer activity not for a class
(k) Leisure	recreation, exercising, shopping, partying, sports
(v) Watching TV	
(s) Sleeping	
(p) Personal	hygiene, eating
(x) Other	
(n) None	no secondary activity

When beeped, do the following: 1. Press the center button until you enter a list of folders. 2. Scroll to the "Received" folder and press the center button. 3. Choose (by scrolling and pressing the center button) the most recent, top message. 4. Scroll to the bottom of the message. DO NOT DELETE ANY MESSAGES SENT. Select "REPLY", and then select "Custom Reply". 5. To enter the code for the activities you are currently performing, first enter the lower-case letter corresponding to your primary activity (the activity you are most engaged in). Second, enter a number between 1 and 6 corresponding to the amount of effort you are putting into that activity, with 6 being the most effort. Third, enter the lower-case letter corresponding to the secondary activity you are performing. If you are not in a secondary activity, enter "n". Fourth, enter a number between 1 and 6 corresponding to the amount of effort you are putting into that activity--if there is no secondary activity, enter "0" (zero). The total amount of effort of both activities should not exceed 6. Last, check your input and send the message by selecting "DONE", then selecting "SEND".

For example, if I was beeped while studying for "this class" while relaxing in the park, I would enter b4k2—the b is for studying for this class, the 4 is for a "4" amount of effort, the k is for leisure time (relaxing in the park), and the 2 is for a "2" amount of effort. The total effort is 6; this is acceptable as it is 6 or less.

Least effort——————————————Most effort

1 2 3 4 5 6

If you have difficulties with your beeper or the use of the coding sheet, call (503) 234-5985 and leave a message for Mike. If you would like the results of this study when it is finished, call Nancy Perrin at (503) 725-5058.

Appendix D

Flow Questionnaire

In what course were you approached to participate in this study?_____

Last six digits of your social security number:
XXX - _ _ - _ _ _ _

Please answer each of the following questions for these situations IN THE PAST WEEK. By "this class", we mean the class in which you were approached to participate in this study.

In general, for each of the following activities, rate the challenges of the activity.

	LOW									HIGH	
1. Attending "this class"	0	1	2	3	4	5	6	7	8	9	N/A
2. Studying for "this class"	0	1	2	3	4	5	6	7	8	9	N/A
3. Computer work for "this class"	0	1	2	3	4	5	6	7	8	9	N/A
4. Attending "other class"	0	1	2	3	4	5	6	7	8	9	N/A
5. Studying for "other class"	0	1	2	3	4	5	6	7	8	9	N/A
6. Computer work for "other class"	0	1	2	3	4	5	6	7	8	9	N/A
7. Other school-related activities	0	1	2	3	4	5	6	7	8	9	N/A
8. Working at a paid job	0	1	2	3	4	5	6	7	8	9	N/A
9. Caregiving	0	1	2	3	4	5	6	7	8	9	N/A
10. Computer activity not for a class	0	1	2	3	4	5	6	7	8	9	N/A
11. Leisure	0	1	2	3	4	5	6	7	8	9	N/A

In general, for each of the following activities, rate your skills in the activity.

	LOW									HIGH	
1. Attending "this class"	0	1	2	3	4	5	6	7	8	9	N/A
2. Studying for "this class"	0	1	2	3	4	5	6	7	8	9	N/A
3. Computer work for "this class"	0	1	2	3	4	5	6	7	8	9	N/A
4. Attending "other class"	0	1	2	3	4	5	6	7	8	9	N/A
5. Studying for "other class"	0	1	2	3	4	5	6	7	8	9	N/A
6. Computer work for "other class"	0	1	2	3	4	5	6	7	8	9	N/A
7. Other school-related activities	0	1	2	3	4	5	6	7	8	9	N/A
8. Working at a paid job	0	1	2	3	4	5	6	7	8	9	N/A
9. Caregiving	0	1	2	3	4	5	6	7	8	9	N/A
10. Computer activity not for a class	0	1	2	3	4	5	6	7	8	9	N/A
11. Leisure	0	1	2	3	4	5	6	7	8	9	N/A

In general, for each of the following activities, time was passing:

	SLOW			AS USUAL			FAST	
1. Attending "this class"	1	2	3	4	5	6	7	N/A
2. Studying for "this class"	1	2	3	4	5	6	7	N/A
3. Computer work for "this class"	1	2	3	4	5	6	7	N/A
4. Attending "other class"	1	2	3	4	5	6	7	N/A
5. Studying for "other class"	1	2	3	4	5	6	7	N/A
6. Computer work for "other class"	1	2	3	4	5	6	7	N/A
7. Other school-related activities	1	2	3	4	5	6	7	N/A
8. Working at a paid job	1	2	3	4	5	6	7	N/A
9. Caregiving	1	2	3	4	5	6	7	N/A
10. Computer activity not for a class	1	2	3	4	5	6	7	N/A
11. Leisure	1	2	3	4	5	6	7	N/A

In general, for each of the following activities, were you in control of the situation?

	NOT AT ALL									VERY MUCH	
1. Attending "this class"	0	1	2	3	4	5	6	7	8	9	N/A
2. Studying for "this class"	0	1	2	3	4	5	6	7	8	9	N/A
3. Computer work for "this class"	0	1	2	3	4	5	6	7	8	9	N/A
4. Attending "other class"	0	1	2	3	4	5	6	7	8	9	N/A
5. Studying for "other class"	0	1	2	3	4	5	6	7	8	9	N/A
6. Computer work for "other class"	0	1	2	3	4	5	6	7	8	9	N/A
7. Other school-related activities	0	1	2	3	4	5	6	7	8	9	N/A
8. Working at a paid job	0	1	2	3	4	5	6	7	8	9	N/A
9. Caregiving	0	1	2	3	4	5	6	7	8	9	N/A
10. Computer activity not for a class	0	1	2	3	4	5	6	7	8	9	N/A
11. Leisure	0	1	2	3	4	5	6	7	8	9	N/A

For each of the following activities, how well were you concentrating?

	NOT AT ALL									VERY WELL	
1. Attending "this class"	0	1	2	3	4	5	6	7	8	9	N/A
2. Studying for "this class"	0	1	2	3	4	5	6	7	8	9	N/A
3. Computer work for "this class"	0	1	2	3	4	5	6	7	8	9	N/A
4. Attending "other class"	0	1	2	3	4	5	6	7	8	9	N/A
5. Studying for "other class"	0	1	2	3	4	5	6	7	8	9	N/A
6. Computer work for "other class"	0	1	2	3	4	5	6	7	8	9	N/A
7. Other school-related activities	0	1	2	3	4	5	6	7	8	9	N/A

8. Working at a paid job	0 1 2 3 4 5 6 7 8 9	N/A
9. Caregiving	0 1 2 3 4 5 6 7 8 9	N/A
10. Computer activity not for a class	0 1 2 3 4 5 6 7 8 9	N/A
11. Leisure	0 1 2 3 4 5 6 7 8 9	N/A

For each of the following activities, how self-conscious were you?

	NOT AT ALL	VERY MUCH
1. Attending "this class"	0 1 2 3 4 5 6 7 8 9	N/A
2. Studying for "this class"	0 1 2 3 4 5 6 7 8 9	N/A
3. Computer work for "this class"	0 1 2 3 4 5 6 7 8 9	N/A
4. Attending "other class"	0 1 2 3 4 5 6 7 8 9	N/A
5. Studying for "other class"	0 1 2 3 4 5 6 7 8 9	N/A
6. Computer work for "other class"	0 1 2 3 4 5 6 7 8 9	N/A
7. Other school-related activities	0 1 2 3 4 5 6 7 8 9	N/A
8. Working at a paid job	0 1 2 3 4 5 6 7 8 9	N/A
9. Caregiving	0 1 2 3 4 5 6 7 8 9	N/A
10. Computer activity not for a class	0 1 2 3 4 5 6 7 8 9	N/A
11. Leisure	0 1 2 3 4 5 6 7 8 9	N/A

For each of the following activities, how clear were the goals of the situation?

	NOT AT ALL	VERY MUCH
1. Attending "this class"	0 1 2 3 4 5 6 7 8 9	N/A
2. Studying for "this class"	0 1 2 3 4 5 6 7 8 9	N/A
3. Computer work for "this class"	0 1 2 3 4 5 6 7 8 9	N/A
4. Attending "other class"	0 1 2 3 4 5 6 7 8 9	N/A
5. Studying for "other class"	0 1 2 3 4 5 6 7 8 9	N/A
6. Computer work for "other class"	0 1 2 3 4 5 6 7 8 9	N/A
7. Other school-related activities	0 1 2 3 4 5 6 7 8 9	N/A
8. Working at a paid job	0 1 2 3 4 5 6 7 8 9	N/A
9. Caregiving	0 1 2 3 4 5 6 7 8 9	N/A
10. Computer activity not for a class	0 1 2 3 4 5 6 7 8 9	N/A
11. Leisure	0 1 2 3 4 5 6 7 8 9	N/A

For each of the following activities, how clear was the feedback received?

	FUZZY	CLEAR
1. Attending "this class"	0 1 2 3 4 5 6 7 8 9	N/A
2. Studying for "this class"	0 1 2 3 4 5 6 7 8 9	N/A

3. Computer work for "this class"	0 1 2 3 4 5 6 7 8 9	N/A
4. Attending "other class"	0 1 2 3 4 5 6 7 8 9	N/A
5. Studying for "other class"	0 1 2 3 4 5 6 7 8 9	N/A
6. Computer work for "other class"	0 1 2 3 4 5 6 7 8 9	N/A
7. Other school-related activities	0 1 2 3 4 5 6 7 8 9	N/A
8. Working at a paid job	0 1 2 3 4 5 6 7 8 9	N/A
9. Caregiving	0 1 2 3 4 5 6 7 8 9	N/A
10. Computer activity not for a class	0 1 2 3 4 5 6 7 8 9	N/A
11. Leisure	0 1 2 3 4 5 6 7 8 9	N/A

For each of the following activities, how automatic were your actions?

	NOT AT ALL	VERY MUCH
1. Attending "this class"	0 1 2 3 4 5 6 7 8 9	N/A
2. Studying for "this class"	0 1 2 3 4 5 6 7 8 9	N/A
3. Computer work for "this class"	0 1 2 3 4 5 6 7 8 9	N/A
4. Attending "other class"	0 1 2 3 4 5 6 7 8 9	N/A
5. Studying for "other class"	0 1 2 3 4 5 6 7 8 9	N/A
6. Computer work for "other class"	0 1 2 3 4 5 6 7 8 9	N/A
7. Other school-related activities	0 1 2 3 4 5 6 7 8 9	N/A
8. Working at a paid job	0 1 2 3 4 5 6 7 8 9	N/A
9. Caregiving	0 1 2 3 4 5 6 7 8 9	N/A
10. Computer activity not for a class	0 1 2 3 4 5 6 7 8 9	N/A
11. Leisure	0 1 2 3 4 5 6 7 8 9	N/A

Appendix E

Motivation Orientation Questionnaire

In what course were you approached to participate in this study?_____

Last six digits of your social security number:
XXX - _ _ - _ _ _ _

Please circle the number that best corresponds to your thoughts about this course. By "this course" we mean the course at Portland State University in which you were approached to participate in this study.

	Strongly agree		Neutral		Strongly Disagree
1. One of my primary goals in this course is to understand the concepts.	1	2	3	4	5
2. One of my primary goals in this course is to do better than others.	1	2	3	4	5
3. One of my primary goals in this course is to not look foolish or stupid.	1	2	3	4	5
4. One of my primary goals in this course is to acquire new skills.	1	2	3	4	5
5. One of my primary goals in this course is to improve my knowledge.	1	2	3	4	5
6. One of my primary goals in this course is to get a high grade.	1	2	3	4	5
7. One of my primary goals in this course is to learn the material.	1	2	3	4	5
8. One of my primary goals in this course is to look capable to my peers and friends.	1	2	3	4	5

Appendix F

Comfort with Technology Sub-Scale

	Strongly Disagree				Strongly Agree
1. I am sure that I will use a computer in my future occupation.	1	2	3	4	5
2. All college students should have some understanding about computers.	1	2	3	4	5
3. I get a sinking feeling when I think about trying to use a computer.	1	2	3	4	5
4. I like computer problems that I can't understand right away.	1	2	3	4	5
5. It is easy for me to understand most technological advances.	1	2	3	4	5
6. I enjoy talking with others about computers.	1	2	3	4	5
7. I sometimes get nervous just thinking about computers.	1	2	3	4	5
8. Having a computer always available to me would improve my productivity.	1	2	3	4	5
9. I have avoided computers because they are unfamiliar to me.	1	2	3	4	5
10. I could get good grades in classes that use computers.	1	2	3	4	5
11. I hesitate to use a computer for fear of making mistakes I cannot correct.	1	2	3	4	5
12. Computers are valuable educational tools.	1	2	3	4	5
13. Most things I can handle okay, but I have trouble working with computers.	1	2	3	4	5
14. If a computer problem was left unsolved after class, I would continue to work on it.	1	2	3	4	5
15. Using a computer is very easy for me.	1	2	3	4	5
16. Once I start working on a computer I find it very hard to stop.	1	2	3	4	5
17. Taking a test on a computer would scare me.	1	2	3	4	5
18. All college students should understand the role computers play in society.	1	2	3	4	5