Sabbatical Project: 2003-2004

Toward a Learning-Based Andragogy

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English and Learning Assistance

Sabbatical Project Proposal for Fall 2003-Spring 2004

Submitted by James Jenkins, Learning Assistance and English, Literature and Journalism

Project Overview

Although a significant portion of my graduate work focused on teaching developmental writing, I had no clear idea what a developmental pedagogy comprised. Then, when I was hired as liaison between English and Learning Assistance, I began to expand my notion of what developmental education encompassed as I realized how necessary an effective developmental pedagogy is—not just in writing classes but in a diversity of curricula at a variety of levels. Many times, my position as liaison has given me the singular opportunity of teaching at five or more distinct program levels; in addition, my work on such committees as Matriculation, Assessment, the Developmental Education Team, the English Department's Basic Course review Committee, and Learning Assistance's Improving Writing Skills and Improving Reading Comprehension committees has reinforced my conviction that a sound developmental pedagogy with effective and comprehensive assessments should not just be a focus of theoretical discussion, research, or workshop participation: it is an academic imperative. I am interested in developing a more distinctly developmental pedagogy that facilitates students' development of what Paulo Freire calls our "ontological vocation": the process of discovering who we are, what we know, and what we need to change.

Since most textbooks simply imply developmental approaches or activities labeled "developmental," I am interested in developing articulated, theory and research-based pedagogical templates that I can then apply to all levels of the various subjects I teach. I intend for this articulation to comprise four elements: developmental education theory, classroom activities, texts for class-based activities, and outcomes-based assessments that can be used directly in the classroom.

Project Report

The product of this research will be (a) systematic notes for each of the four elements listed above, (b) an annotated bibliography of sources, and (c) a brief list of web sites that could be used as resources for the creation of a developmental pedagogy. First, the notes will contain both an outline and overview of each of the four elements of a developmental template. The second component, the annotated bibliography, will provide both source and content information

as they relate to the four elements of focus. The third component will provide listings of reputable, well-established websites that can provide further information for each element.

The final report will compile these three components with a brief introduction and overview. This format will allow anyone using the report to access all resources related to the four elements of articulation. This format will be useful as a template for pedagogical developmental and as a general research tool for faculty and students. A timeline for my research for both semesters is provided at the end of this proposal.

Benefits to Students, Department, and College

This project will provide benefits to myself as a scholar and teacher, to my students who will receive the most direct benefits of the project, to my department, and to the college, especially as it moves toward a learning outcomes model of assessment. As a scholar, this systematic research will allow me to become more fluent in the vocabulary and practices that are informing current, effective educational practices. As a teacher, I will become better equipped to facilitate the success of my students at the multiple skill levels and diversity of subject areas my position as liaison grants me exposure to. My department will benefit because as an informed practitioner of developmental pedagogy and learning outcomes assessment, I will become a resource in their continued professional growth and facilitation of their students' success. Finally, because my project is multi-leveled and inter-disciplinary, I will become an informed resource for faculty in other departments—regardless of the content of their curricula—and even for programs that are interested in increasing the effectiveness of their curricula. This influence could eventually take the form of written and verbal reports, workshops, and continued dialogue within the committees I currently participate.

Proposed Timeline

August – October 2003: Developmental Education theory.

Sample Topics: learning theory, brain-based research, adult student-directed learning

November – December 2003: Developmental activities

Sample Topics: text-based, in-class, extended, content-oriented, metacognitive, affective

January – February 2004: Texts that facilitate effective activities

Sample Topics: theoretical/background, content (including literature), process

March – May 2004: Assessments

Sample Topics: learning outcomes-based, student-directed, instructor-directed, content-specific, process specific, measuring what student knows/thinks/does/feels

Addendum

Sabbatical Project Proposal for Fall 2003-Spring 2004

James Jenkins, Learning Assistance and English, Literature, and Journalism

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Since most textbooks simply imply developmental approaches or activities labeled "developmental," I am interested in developing articulated, theory and research-based pedagogical templates that I can then apply to all levels of the various subjects I teach. I intend for this articulation to comprise four elements: developmental education theory, classroom activities, texts for class-based activities, and outcomes-based assessments that can be used directly in the classroom. In order to more fully explain the scope and intended products of this project, I would like to 1) define terms, 2) explain the process, 3) clarify the products, and 4) expand my timeline.

Definitions

A) Developmental pedagogy

A developmental pedagogy is based on several assumptions that a developmental educator holds about both the way people learn and, therefore, the way people can be most effectively taught. A developmental educator is interested in:

1) what students ***know*** (content)
2) how students ***think*** (process)
3) what students ***do*** (act, produce)
4) how students ***feel*** (about their confidence, ability)

5) how to measure these four areas in order to facilitate maximum student success

A developmental pedagogy, then, comprises the activities, texts, and assessments an educator designs to address these five areas.

B) Learning outcomes

Essentially, a learning outcome has two characteristics:

1) It is what an educator would like to see a student know, think do, or feel; and

2) It must be measurable.

What makes an outcome different from a measurable objective is that an objective is often based on activities that lead to a certain result, but an outcome does not infer any particular process or activity, Therefore, it is singularly focused on student performance.

C) Pedagogy templates

A pedagogy template is an itemized structure based on research and informed practices that can be used to develop components of a course. In this case, the structure could take many forms including a list of criteria or even a series of questions. For example, if I wanted to create an assessment for a certain outcome, I could use an assessment template that might look something like this:

1) What outcome am I trying to measure?

2) Is it what the students know, think, do, or feel?

3) What are the characteristics of this aspect of learning? (i.e., what does knowing, thinking, doing, or feeling *look* like in this context?)

4) What information have the students generated or been given regarding the outcome?

5) What activities have the students engaged in that facilitate the outcome?

6) What is the desired content of the assessment?

   a) empirical

   b) anecdotal

7) What is the most appropriate form of the assessment?

   a) external objective

   b) external subjective

   c) self assessment

With a template like this, I could ensure that each assessment I create:

1) adheres to current developmental theory and practices

2) is appropriate for the outcome being measured

D) Assessment instruments

A tool designed to measure learning. Assessments can take many forms; many of the most common are objective tests and essays. However, assessments can take other forms including collaborative projects and self-assessments.

Process

The process of the project has two parts.

1) Research

Attending conferences and interacting with colleagues, especially in committees, has afforded me a general understanding of both developmental education and learning outcomes. However, because of the paper load required to teach a minimum of five composition classes each semester and summer sessions, I have been unable to accomplish more extensive research. This sabbatical would grant me the time to investigate current developmental theories and practices as well as how learning outcomes are applied in various contexts. In regards to developmental practices, I would like to know:

1) what students know including a) how the brain learns, b) how individuals learn, c) how different types of content affect the way *that* content is learned and stored, d) how to articulate between "knowing" and "thinking", e) how to measure what students know;
2) how students think including a) criteria that define critical thinking, b) how to expose and articulate student thought processes in order to make them more critical, c) how the forms of critical thinking change in relation to the content they are being applied to, and d) how to measure how students think;
3) what students do including a) how to create activities that lead to successful student performance, b) how to accurately measure what students do, c) how to measure the link between what students know, think, and do;
4) how students feel about their learning including a) how students' sense of what they know, think, and do affects their success;
5) how to create learning outcomes that accurately measure what students know, think, do, and feel;
6) how to create assessments that accurately measure the completion of a learning outcome.

2) Development

Once this research is completed, I would like to use the results to create developmentally sound templates that a) I can use in the development and organization of my courses and b) that my colleagues can use in the development of their courses.

Products

Even though I will be engaged in an extensive amount of research, I am ultimately interested in developing tools that both my colleagues and I can use repeatedly in the development of our courses.

1) **systematic notes** for each of the following elements:
   a) developmental education theory and practices; this will include summaries of current developmental education models including the context in which they are most appropriate and practical applications within the classroom;
   b) learning outcomes; this will include summaries of current models and how those models are applied to a variety of educational contexts;
   c) assessment models; this will include summaries of models and descriptions of their effective use in relation to developmental and outcomes-based pedagogies;
   d) processes for creating classroom activities, choosing texts, and creating assessments that incorporate developmental theory, outcomes structure, and effective assessment practices;

   These notes will be organized in such a way that they can be used as a reference for anyone who would like an overview of the current research and practices in these areas.

2) **an annotated bibliography** of sources on which the notes are based; this bibliography will be arranged according to the content area they represent (i.e., developmental theory, learning outcomes, or assessment). This bibliography will include references to both bound texts (books, periodicals, etc.) and electronic texts including a list of web sites and internet-based texts.

3) **templates** that will allow any educator to create outcomes, assessments, and even choose texts and activities that are developmentally sound and outcomes-specific. These templates will be organized so that they can be easily accessed and used by anyone. An example of how they may be organized first by the area they address (i.e., learning outcomes, assessments, texts, activities) and then further organized by what developmental mode they address (i.e., know, think, do, or feel.) For example, there would be a minimum of four outcomes templates; each template will focus on a different mode, so an educator could use one template to develop an outcome for what a student knows, another template to develop an outcome for what a student thinks, a third for what a student does, and a fourth for how a student feels. There would be four such templates for each area:

   learning outcomes
      know (one template)
      think (one template)
      do (one template)
      feel (one template)
   assessments

know (one template)

think (one template)

do (one template)

feel (one template)

and so on . . .

There are certainly other organizational structures; I will let my research and the ease of use determine the final structure.

Timeline

August – October 2003: Developmental Education Theory Research

This is the foundation of the entire project. Whatever else I develop, whatever else I use, I must be assured that it depends on a developmental approach—the way people learn (know, think, do, feel). Since the resulting templates will be based on these four elements of learning, I must be confident that a) I know what they look like, and b) how they are influenced (taught). During this period, I will be:

1) assembling the first portion of my bibliography, and

2) creating the first layer of my templates, specifically, the criteria that determine what knowing or thinking or doing or feeling looks like.

November – December 2003: Development of Templates for Creation of Developmental Activities

After completing the initial research on developmental theory and developing the developmental foundation for the templates, I will create the

1) first complete template—focusing on activities in the classroom, and

2) an assessment of the activity

This template will be able to be used as a basis to create activities for a class that are developmentally sound. The assessment (that I will create concurrently) will be able to be used to measure the developmental effectiveness of the particular activity *after* it is used in the classroom.

January 2004: Development of Templates for the Choosing of Texts That Support Developmental Activities

Since many classroom activities (especially in English and composition classrooms) are text-based, I would like to develop a template that will allow an instructor to evaluate a text for its developmental potential and its ability to be used as a basis for developmental activities.

February-March 2004: Learning Outcomes Research

This is the second important foundation of this project. After developing a competent understanding of development theory and practices, I would like to develop a similar understanding of learning outcomes

theory and practices. As I continue to collect sources for the bibliography and generate notes on my findings, I want to:

1) learn about the various manifestations of learning outcomes models
2) learn how those models are informed by and affect developmental practices
3) begin developing a general template that could be used to create outcomes—especially to be used by instructors who know little or nothing about outcomes-based learning

April-May 2004: Research and Development of Assessment Templates

My research will now focus on the assessment of developmental learning outcomes. From what preliminary research I have done, it is clear that outcomes-based learning is intimately connected to outcomes-based assessment. Therefore, even though I am committing the previous two months to learning outcomes models, I realize that I will be researching assessments of those models at the same time. In these final two months, then, I plan to:

1) complete my research on outcomes-based learning and assessments
2) complete development of learning outcomes templates
3) complete development of assessment templates
4) organize notes
5) organize bibliography

It is my intention that the products of this project (notes, bibliography, and templates) will be able to be used by any instructor interested in:

- learning more about developmental education
- learning more about outcomes-based learning and assessment
- creating a developmentally sound pedagogy
- creating outcomes that are consistently based on what and how a student learns
- creating assessments that accurately measure that learning.

Therefore, I want these products to be practical and accessible, and because there are disparate groups on this campus that are involved in the discussion and use of different aspects of this research already, I see this project as being a way to finally create a baseline that interested faculty, staff, managers, and committees can use in the continued investigation of developmental pedagogy and outcomes-based learning and assessment at all levels of the institution.

Statement of Purpose

This project was intended to allow me to create general design templates that any instructor could use in any course to design activities for and assessments of student learning. Because our student populations are adults, it was my intention to review research and theory on adult learning and educational practice and apply the results of that review to the development of the templates. It is my hope that the templates will not only be practical tools but that they are founded on sound, theoretical and practical principles.

I have written the project in a way that I hope will be accessible to anyone interested in increasing student success, but my specific audience is the classroom instructor. I must note at this point that in my original proposal, I specified I would be creating, essentially, an expanded annotated bibliography of sources along with notes from those sources in order to articulate my findings. I soon discovered, however, that the lack of context for the information would isolate that information and make it difficult to access. As I learned more and more about how adults learn, I became convinced that learning that occurs outside of a context is not authentic learning.

Therefore, I have modified one aspect of my project in that instead of creating an extensive annotated list of sources and notes, I have taken those sources (82 of them) and along with my notes, created a context for their articulation in the form of a thesis arguing why, as adult educators, we should embrace a theoretical, research-based approach to the development of our instructional processes (andragogies). It is my hope that although this structure deviates from the original proposal slightly, it has, nevertheless, resulted in a much more valuable product for Mt. SAC.

Statement of Value

Our institution is on the verge of applying a learning outcomes model of instructional design and assessment to every instructional program on campus. Although this specific model is one of the most effective in ensuring quality learning and success, many elements of it are often misunderstood and, therefore, disregarded. Regarding learning-based instruction and learning outcomes, the research and resulting templates in my project will provide:

- a historical and theoretical perspective of outcomes-based education
- specific definitions of terms and explanations of the significant elements of outcomes-based learning and assessment
- the theoretical basis for the development of a sound, instructor-specific outcomes-based andragogy
- templates for the development of learning-based outcomes
- templates for the development of criteria-based outcomes
- templates for the development of assessments of general instructor and learning processes

The products of this project are be practical and accessible, and because there are disparate groups on this campus that are involved in the discussion and use of different aspects of this research already, I see this project as being a way to finally create a baseline that interested faculty, staff, managers, and committees can use in the continued investigation of learning-based andragogy and outcomes-based learning and assessment at all levels of the institution.

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Preface

This project is the result of many years of self-questioning—not only of my professional abilities and goals, but also, in a larger sense, of who I really am when I call myself "teacher." Like many of you, I have spent some significant time analyzing my assignments, approaches, and attitudes regarding my students in an attempt to make the learning in my classes more effective, more satisfying, and more profound. I must admit that the longer I am employed as a teacher, the less satisfied I become with my effectiveness as a teacher; the less prone I am to equate what I *have* done with what I *can* (or even *should*) do. When I first started teaching, I honestly believed the opposite would happen: I thought one of the marks of a "good" teacher was someone who had reduced the process to a science and could teach brilliantly on auto-pilot. However, as I began to think about the great teachers I had learned from as a student, as I began to learn about the learning process itself, and as I was exposed to people who saw teaching not as an occupation but as a vocation, it quickly became evident that I would not get off the hook that easily. Not only is a little knowledge a dangerous thing; it's also irritatingly uncomfortable.

My experience, my research, and even my instincts have convinced me that any effective approach to teaching should not be regarded as a system or focused on a particular *level* of student; nor should it be defined as "effective" simply because it comprises the use of a particular set of tools or activities. Rather, effective teaching is teaching based on the understanding of how people really learn and the belief based on that understanding that they *can* learn. Being an effective educator begins with being an attentive and thoughtful human being—someone with the ability to look inside him/herself as well as be aware of what others are doing, thinking, and feeling. As professionals who have spent their lives in both formal and informal educational settings, we have clearly learned one thing—the world is a vast, diverse environment

and that diversity is the basis for the abundant richness of experience we enjoy. Whether we experience the pleasure of that diversity through science, mathematics, literature, art, or sports, we have learned that the critical mind understands and embraces diversity as the cornerstone of a progressive, civilized life.

And yet . . . with all this knowledge and experience, we tend to teach as if there is a very narrow range of experience, and worse, a narrow range of how that experience should be processed and expressed. We often forget that there is actually *not* just one way to solve a problem or describe a process or write an essay—or that even an "essay" itself is often an artificial structure we *impose* on students' thinking rather than allowing it to be used as an organic tool to *express* thought. Because as teachers we enjoy learning and discovering how systems work, we sometimes lose sight of the fact that the guidelines and structures we use to help clarify and demonstrate concepts and abilities are just that—guidelines; they are *not* the abilities themselves. In our attempt to find out what students *know*, we often force them into very narrow measures of that knowledge. What we need to do is, first, realize that not only are there different levels of learning, there are also different ways of "knowing" those levels. This epistemological diversity also means there are different ways of demonstrating knowledge—there are different things that students can "do" to show their knowledge. If we attempt to restrict students to 1) one or two ways of knowing, and 2) one or two ways of demonstrating their knowledge, not only do we contradict natural learning patterns but only reinforce temporary, content-specific knowledge acquisition rather than deeper and more lasting learning.

Therefore, I am becoming more and more convinced that the effective educator is someone who not only loves learning but understands *how* learning takes place, how to affect the learning process to increase its quality, and that learning is essentially a dialogue based on a

personal relationship—between two people whose ability to participate in the dialogue is affected by what they think, what they know, what they do, and how they feel. In this dialogue, I am learning to use what Paulo Freire calls "true words" with the goal of not just teaching a subject or discipline; those are simply means to an end. My goal is to "risk an act of love," a true commitment to others which leads to the mutual discovery of our individual "ontological vocations": the knowledge that we are Subjects who have the power and responsibility to act on and transform our worlds to make them richer and fuller for ourselves and others (Freire, 1970).

My sole purpose in originally proposing this project was simple—I wanted to "catch up" to my colleagues, develop some new, more effective strategies for the classroom, and, more simply, learn how to be a better teacher. As a composition instructor for over ten years, I have been so involved with reading and grading students' writing, I have found little time to stay current with the research about learning that is flooding my profession on a daily basis. I have always felt that anyone who adopts the label "professional" is someone who, at least 1) maintains currency in the ideas, theories, and practices of the profession, and 2) adds to the collective professional consciousness through research and writing. Although being a writing instructor has left me precious little time for either, I can see all around me—in the processes and activities of other teachers, at professional conferences, on listserves, in the handful of professional journals I do manage get a goods glimpse of—that teaching is changing. I began to feel left out, and worse, I honestly began to feel that my students were suffering as a result of my lack of professional expertise. These factors began to gnaw at me until I realized that the only way I could update and refine what I considered a grossly inadequate knowledge of my field was to take some time away from teaching and focus completely on significant and current research in learning, adult learning, and the teaching of adults.

As I began my search, I immediately understood that my goal was daunting. In order to develop a more than cursory understanding of adult learning, I needed to explore such diverse fields as anthropology, sociology, biology, cognitive psychology, behavioral psychology, and cognitive neuroscience, as each of these fields provides a valuable perspective into both human learning in general and adult learning specifically. Being a student again has been a heady experience, and I am reminded why I loved going to school so much: there is so much to know, and this knowledge offers the hope—the possibility—that things can be better. However, I also quickly began to realize that both my time and the scope of my proposal was going to necessitate a narrow focus of my ultimate research. As a result, I wanted to review what research in the fields that are currently dominating learning research and theory—neuroscience, cognitive psychology (including educational psychology), and nonintellective investigations including emotional and social intelligence—is telling us about how people (adults) learn.

I do not want this project to be a wand that I wave over the hat of my teaching and pull out the rabbit of success. I have enough experience to understand that there is no magic bullet of student success. But I believe I can make a difference in the lives of my students; I believe I can be a better teacher, and I want my teaching to be as fulfilling as it is effective.

Introduction

Although there is increasing attention being paid to adult learning, most learning research to date has focused on children. There are certainly many reasons for this, not the least being that it is easier to identify and measure learning in children because their learning development is both constant and pronounced. However, there may also be an implicit assumption about adult learning that has attenuated research in this area—an assumption that I have seen (and been guilty of applying) all too often in the classroom: Adults already know how to learn, and if they

don't, they don't belong in college. If this is true, it is certainly one reason why learning-based approaches like developmental education are applied almost exclusively to underprepared students, often in remedial settings. Even the often orphaned child of educational psychology has only recently begun to focus on adult learners, and specifically college learners.

Reinforced by the explosion of information on learning resulting from comprehensive neuroscientific research on the brain over the last fifteen years, behavioral and cognitive psychologists (including educational psychologists) are giving us ever-widening glimpses into adult learning processes. Contemporaneously, adult educators at all levels are becoming both aware of and interested in how research-based learning theory can inform their own theories and strategies and increase student success. It is also not surprising to learn that there are still many of us who eschew not only scientific research but learning theory in general. Because of our many tacit assumptions that adult learners come to us already equipped to learn, we have often become simply conduits of content, focusing only on what we *want* students to learn, not *how* we want them to learn, or, more fundamentally, *how* they actually learn. We often take very little time to evaluate what actual learning takes place or how what we do as teachers affects that learning.

Although I believe that a good teacher has good instincts about the way students learn, it is often very difficult to measure those instincts and even more difficult to reproduce those instincts in other teachers and other contexts. Therefore, I agree with Richard Mayer that, whenever possible, we should base our "educational practice on scientific research methods and theories rather than relying on popular opinion and doctrine." In doing so, we are more likely to avoid "well-intended fads [. . .] and doctrine-based agendas" (Mayer, 2001a, p. 83).

The purpose of this project, then, is twofold:

1) to examine current research including theories that inform adult learning, and

2) to extrapolate instructional applications in the form of general guidelines for class activities and evaluations that are consistent with what is common in this research.

In reviewing this paper, it is important to remember:

1) The term "Developmental Education" is generally used to refer to an approach to education whose goal is to facilitate success for marginalized and underprepared students, often in a remedial setting. (In general, "remedial" refers to an approach that attempts to "fix" something that is wrong in the student's knowledge base with little concern for any learning that occurs outside the particular skill in question.) Because these students have not been successful in "traditional" educational programs, educators who work with these students tend to look for new ways to increase student success that exist outside of these traditional programs. Historically, one of these ways has been to look to theories and research on cognition, consciousness, and learning that can provide insight into how people learn. This is not meant to suggest that any teacher who does not identify her/himself as "developmental" is not an effective teacher or does not support research-based education; likewise, it is not meant to suggest that developmental approaches are the only successful approaches to teaching and learning. Historically, however, some educators who are interested in the processes of their teaching as well as its content, have often found themselves gathered together within organizations and conferences that are labeled "developmental."

2) It is my intention in this paper, whenever possible, to broaden the term "developmental education" beyond its referent to working with marginalized or underprepared students and include any approach or theory that focuses on how *any* student learns.

3) Learning theory and practice is based on the synthesis of several sciences including neuroscience, psychology, sociology, philosophy, and anthropology. In order to address the second goal of this paper, to develop general guidelines for class activities and evaluations that are consistent with what is common in this research, I have limited the focus of my review to the fields of psychology (including cognitive and social), neuroscience (brain research), and research into non-intellective learning such as emotional and social intelligences. Based on my research into these areas, it is my contention that effective adult teaching processes (andragogies) are the result of sound educational learning theories, which themselves are based on multi-disciplinary research into how people learn. Therefore, whenever possible, instead of using the term "developmental," I will use the terms "learning-based" or "natural learning" in an attempt to indicate that andragogies based on learning theory and research are not confined to learning that occurs in a particular student group but can be applied to every student at every level of learning.

4) Historically, most research into human learning has been done with animals and children. More recently, neuroscientific research into how the brain learns has focused not only on children but also brain injured patients. Although there has been some research into how adults learn, much of this research has been based on conclusions drawn from research with children or more specifically focused on the social and affective (self-reflective and emotional) aspects of learning. Although research into adult learning and the development of specific adult learning theories is growing, there is precious little general adult learning theory to be had. The conclusions that I draw about adult learning and subsequently apply to the templates I will be designing in the second half of this paper, therefore, will be a

product of specific research into adult learning and conclusions I have drawn from general learning research. I have made every attempt to make the conclusions I have drawn based on general learning research consistent with what I believe to be common elements in human learning, not simply learning characteristics confined to children and adolescents. With that being said, I do not believe that all research related to knowing, even learning, is applicable to educational systems. Educational theory is a specific *use* of research into knowing how we think, know, and learn; it does not automatically follow from such research. Therefore, there should be no (nor will I) attempt to synthesis every aspect of learning research into an instructional application.

A Very Short and Concise Recent History of Knowledge and Learning

Developmental education is, simply, effective, learning-based education. It is an approach whose resulting processes are based on research into human development and learning, comprising such diverse areas as cognitive psychology, neuroscience, biology, sociology, and anthropology (Rose, 1998/1999; Kozeracki, 2002). In order to more fully understand the application of learning theory and research to education, it is important to have a basic understanding of the historical development of this connection. Any study of learning is really a study of knowledge—how we respond to it, acquire it, process it, and apply it. This epistemological expedition uncovers the framework within which learning research occurs, learning theories are developed, and educational applications are designed.

1800s to 1920s

By the last quarter of the 19th century, universities began formally to address the needs of underprepared students. Even at schools such as Harvard, 50% of incoming freshman were failing the entrance exam (Casazza, 1999). This type of experience was being duplicated in

universities and colleges across the country on a scale large enough that by the end of the 1800's, these schools were providing extra assistance to their students in the form of both classes and whole programs; some of these programs were so extensive that they became recognized as "secondary schools within colleges" with some offering degrees over a six-year period instead of the traditional four-year period (Casazza, 1999). Although the term "remediation" was not applied to this type of instruction at the time, the approach of viewing the student as being "deficient" and needing to be "fixed" or "cured" was the operable pedagogy of the day (Casazza, 1999, p. 6).

Besides the attempt to remediate, another striking similarity exists between the way many current institutions and the institutions of the past approach the underprepared: the identification of the cause of this underpreparedness as being the secondary schools. How often do we hear the lamentation in our breakrooms and hallways, "If only the high schools could do their jobs, our students would be better prepared"? In response to this wailing, a group called the Committee of Ten, comprising college and university presidents, was established by the NEA in 1892 to evaluate this issue of underpreparedness at the college level. One of their recommendations was to transfer some of this new college curricula back to the high schools, resulting in an overall increase in standardization of the curriculum in secondary schools (Casazza, 1999). Even though there was some movement to return the teaching of basic skills to the secondary schools, many of these programs remained at the college level and even flourished.

By the first decade of the 1900s, "remedial" and "study skills" were terms that were being applied to these new type of curricula at the college level with over 350 institutions offering courses in such programs. One of the basic tendencies of these programs was to blame someone else, either the student or the previous step in the system, rather than evaluate and change the

quality of learning taking place at the current step. Sound familiar? Of course, having no understanding of the learning and education processes other than simply the transmission of information and a resulting change in behavior (performance), it is not surprising that this approach was essentially the only course of action (Mayer, 2001b). Thus, what we often identify today as developmental education began in the 1800s as remedial programs to help prepare students for the reading and writing literacy of their college classes (Casazza, 1999). This notion of literacy has been a common thread in developmental programs throughout history. Although there have been attempts to create focused definitions of literacy (e.g. the SCANS competencies for the workplace and even E.D. Hirsch's theory of cultural literacy), a definition of literacy is usually determined by specific communities at specific times and is dependent on a person's "status, occupation, and interests, as moderated by one's environment" (Kozeracki, 2002, p. 83). Since the definition of literacy is so diverse, it is no wonder that adult students entering post-secondary learning environments are often underprepared (a code word for "not literate") and why institutions of higher learning, who often operate on myopic definitions of literacy, view these students as subjects needing to be "fixed," "filled-in," or "repaired."

The Rise of Behaviorism

It wasn't until 1926 that any coherent learning theory was applied to educational practice. In his book Educational psychology. Volume 1: The original nature of man, E. L. Thorndike proposed that the connection between a stimulus ("situation") and a person's response to that stimulus is rooted in the physiological processes that occur in the brain's neurons (Mayer, 1998). Foreshadowing the neuroscientific learning research that would occur 60 years later, Thorndike argued that learning was simply a physiological process that could be both attenuated and strengthened by the environment. When this theory was translated into educational practice, it

became known as the "connectionist" or "response strengthening" theory. When applied to teaching, this theory regarded the learner as "a passive recipient of rewards and punishments" and the teacher as being the "dispenser" of those rewards and punishments (Mayer, 2001b, p. 40). Since rewards are more desirable than punishments and "almost all living things act to free themselves from harmful contacts" (Skinner, 1971, p. 26), it was argued that students would repeat a response in order to obtain rewards. Therefore, the more correct responses students gave, the more rewards they would receive, and the stronger their tendency to repeat those responses would be. This was a simple pedagogy because essentially the entire instructional process could be accomplished by exercising and rewarding correct responses (connections) and attenuating or punishing incorrect connections (Mayer, 2001b, p. 41).

Although not the first theory of its kind, this stimulus-response (S-R) theory was the first of many such theories to be applied to instructional practice, forming the basis of what would soon be known as "behaviorism" and behavioral learning theories. Research in this area is still ongoing, but the most intense research activity occurred between the 1920s and 1950s. Although behaviorism has been largely supplanted by cognitive theories of learning in educational settings in the last half of the 20th century, many instructors still create lesson plans, choose texts, and plan activities based on general behaviorist models. It is for this reason, the persistent existence of behavioral pedagogies, and the fact that behaviorist models of instruction do not account for the creation of meaning and understanding that a further look at behavioral theories is helpful.

It is important to keep in mind that most of the research leading to behavioral learning theory utilized animal and child subjects, often extrapolating conclusions derived from animal research to human beings. It is interesting, in retrospect, that human learning theories based on animal behavior research became so accepted and, eventually, so popular. After all, almost 30

years before Thorndike, one of the pioneers of S-R theory (also known then as "conditioning" theory), Conwy Lloyd Morgan (1896), argued that theories to explain higher cognitive processes in humans (like language) had only limited application to human behavior because of the "possible qualitative differences between human and animal psychological processing," and he warned against the severe limitations of assuming human characteristics from animal behavior (Greenwood, 1999, p. 3). Although the wisdom in this perspective is undeniable, it is also one of the reasons why S-R researchers such as Thorndike and later Clark L. Hull and B. F. Skinner, who did not deny the existence of cognitive states, virtually dismissed cognitive processes altogether as meaningfully measurable influences on human behavior. What couldn't be observed (and therefore measured) by the behaviorist researcher was not seriously considered.

Central to the behavioral construct of learning are two principles. First, "observable behaviors," not "unobservable thoughts" (such as feelings, understanding, images, perceptions) are the "only legitimate subject matter of psychological science." B. F. Skinner (the father of Behaviorism) argues that the more important phenomena to observe and measure in relation to knowing and learning are observable environmental contingencies that have been created throughout an individual's history and that have conditioned that individual to behave in a certain way. For example, we can measure that a baby responds to her mother's face differently than she does to other faces. But where a cognitive psychologist might argue that this distinction is a result of *perception*, Skinner argues that it is simply a result of prior contingencies—prior conditioning that occurs when a powerful stimulus becomes a permanent part of our environment (Skinner, 1971). For the behaviorist, then, perception is a result of conditioned contingencies, not constructive thought. A second principle of behaviorism is these thoughts (also known as "cognitive constructs") can only be considered as legitimate subjects of research insofar as they

are defined as "internal states" that explain behavior. Although most behaviorists do not deny the existence of inner (cognitive) constructs, they view them as actual motor responses rather than "centrally initiated states"; and because they are not observable, they have no place in the "functional analysis" of behavior (Greenwood, 1999); because they are "out of reach of introspection [. . .] we must content ourselves with a person's genetic and environmental histories" (Skinner, 1976, p. 19).

Skinner's main objection to the consideration of cognitive and affective causes of behavior is that rather than these processes of a "fanciful inner world" being the cause or source of behavior, they produce metaphors of reality that we then need to reposition back into reality. In other words, we create symbols to explain the way reality works, and then we place these symbols of meaning into our world believing that they *are* reality, as if they existed *before* we created and put them there, forgetting that they are non-natural constructs an not *a priori* truths. We say a rope is "strong," and pretty soon we begin referring to its strength. We then label that specific characteristic of strength "tensile" and then proceed to argue that the rope is strong *because* of its tensile. Whether this is true or not, by arguing that strength is determined by tensile, (or tensile causes strength) we are arguing a single, arbitrarily assigned *cause* of strength without considering there might be other causes. Skinner argues that because this labeling process—the creation of metaphors—is influenced by "feelings and introspective observations," whose relevance is usually subjective and therefore inaccessible, focusing on this and associative cognitive processes prevents us from observing the more "accessible" physical environment for explanations of cause and effect. What many psychologists (and now, neurobiologists) now believe about how human thought processes influence learning and behavior, Skinner referred to as "one of the great disasters" in the history of human thought (Skinner, 1976, p. 182).

Some researchers, like Hull (who began his research on behavioral learning in the 1920's, about the same time as Thorndike) even go so far as to create a pseudo-recognition of cognitive constructs by studying what he calls "concept formation," implying that he was actually studying a cognitive event. However, what he identifies as "concept formation" is nothing more than "associative learning," a concept basic to almost all behavioral theory. Associative learning occurs when a subject develops the *habit* (a conditioned contingency) of using a certain label (word) when it identifies (discriminates) a specific stimulus. Behaviorists argue that this associative habit (associating the label with the stimuli) signals the subject's ability to understand what the label *means.* In this particular case, Hull taught children to discriminate "dog" stimuli and then attach a verbal label "dog" to that stimuli. He contended that the children were able to discriminate "dog" because they understood the *concept* of dog. However, what he was really measuring was conditioned (associative) responses that Pavlov had previously proven have nothing to do with meaning but have everything to do with conditioned habit (Greenwood, 1999). Essentially, behaviorists believe that learning *is* behavior: The way to produce the desired behavior is to reward the desired behavior and extinguish (through withholding reward or even punishing) the unwanted behavior (Reardon, 1998/1999).

In order to appreciate the difference between behaviorist and cognitive learning, it is important to understand that successful associative behavior does *not* imply the creation of meaning or understanding—simply habit; it is this fundamental lack of being to able to prove meaning or understanding that is the soft under-belly of behaviorist theory: You can certainly change a student's behavior, but for how long, and, more importantly, what learning (in the form of meaning and understanding) has taken place? In other words, would any of those children in Hull's experiments be able to apply the *concept* of "dog" in another context or be able to explain

that concept to someone else? Since educational remediation is based on associative (S-R, response-strengthening, conditioning) learning, it cannot ensure the creation of either understanding or meaning.

One of the most common instructional methods derived from associative learning theory and pervasive in remedial instruction is what we call the "drill-and-kill" method. This method relies on highly structured activities with finite responses, repetition, and feedback limited to the correction of the response. We commonly see this method displayed in workbooks and handouts, but with the advent of technology, we often see this as the core of many computer-assisted instruction programs. This approach is soundly grounded in Skinner's most significant contribution to behavioral psychology, "operant conditioning" which argues that you reinforce what you want the subject to repeat and you ignore the behavior you do *not* want repeated (Merriam & Cafarella, 1991; Skinner, 1976). There is very little question that instructional methods based on this type of theory are effective to a certain extent, as long as the knowledge that is being assessed and reinforced is a collection of facts and not contextualized nor assumed to infer how or what the student thinks. Since this type of remediation is designed simply to "fix" something finite that is "wrong" or missing in the student's knowledge base, there is no interest in understanding or addressing any other aspect of the student's so-called learning. This is the essence of the remediation model, a model that applies certain courses of instruction "as a remedy that will fix the student or some weakness exhibited by the student" (Kozeracki, 2002, p. 84), and it is based on the belief that learning is the accumulation of distinct skills (Marzano, Pickering, & McTighe, 1993). What makes this instructional approach unsound is that it focuses on only one aspect of a student (e.g., a particular fact that either the student knows or doesn't know) and assumes that this one aspect "represents the whole" of the student's limitations and

capabilities (Kozeracki, 2002; Casazza, 1999). This focus on simple responses eliminates the learning and evaluation of the more complex thinking structures we would expect to see in adults—and that we implicitly expect from all of our students (Mayer, 1998).

The Transition from Behaviorism to Cognitivism

By the 1950's, psychology (behavioral, social, and cognitive being only three of many general forms, with each form having several sub-groups) had taken its unrelenting foothold in the development of learning theories and educational practices. The advancing Freudian and Gestalt approaches to personal behavior argued that we are much more than a product of our biological processes—that each of us has a consciousness (often existing at more than one level), and it is the elements of this consciousness—senses, reactions, perceptions, insights, and understanding—that inform our behaviors. The Gestaltists (*gestalt* being a German word meaning pattern or shape) argued that instead of looking at isolated aspects of learning (like behavior only), it was important to look at the "whole" process of learning and find the patterns (a characteristic of learning that neurobiologists would confirm decades later naturally occurs in the brain). They believed that the environment is more than just a trigger for behavioral response: It is a vast network of opportunities in which learners create meaning from their experiences as they create connections with other experiences (Darkenwald & Merriam, 1982). Gestaltists also posited (in a further foreshadowing of constructivist psychology) that the learner has control over what is learned and it is not simply a result of behavioral conditioning (Merriam & Cafarella, 1991).

Although behaviorists did not deny that there are other elements besides stimulus-response behavior involved in learning, they believed the influences of these other elements on behavior to be slight and their influence on learning minimal, if not non-existent; a behaviorist

would flatly deny that the learner had any control of her learning. However, during the 1950s, a new branch of behaviorism began to develop, following closely on Hull's identification of "concept formation." Although these "neobehaviorists," most popularly represented by the notable B. F. Skinner, were behaviorists to the core (believing that the only authentic measure of learning was a change in a subject's behavior), they began to recognize these elements of consciousness as "intervening variables" and "hypothetical constructs" (Greenwood, 1999). These variables were rigidly defined, and they were only considered in a theoretical sense; however, the use of these variables, even hypothetically, allowed the neobehaviorists to avoid the anthropomorphism that Morgan warned about decades earlier (Greenwood, 1999). In addition, although these variables and constructs bore no similarities to what cognitive psychologists were simultaneously identifying as *real* cognitive processes that could be controlled to produce meaning and understanding, the neobehaviorists were beginning to bridge a gap between the two fields of psychology that would soon dominate educational theory and design: behaviorism and cognitive developmental psychology.

One of the most significant results of this exploration into how consciousness affects behavior was the conclusion that not only do we make *connections* with information, we actually *manipulate* information (make choices regarding it) before we commit it to memory; that means that even though learning is still measured by changes in behavior, we are no longer passive vessels simply creating habits as a result of reward conditioning (Mayer, 2001b). This new approach to our relationship with knowledge was also fueled by the rise of the computer—a machine that essentially accepted inputted information, performed "operations" on it, and then stored that information in its memory (Mayer, 2001b). This has been one of the most persistent models of human learning of the last two decades: the model of the brain as a human computer.

In an attempt to define "intervening variables" and "hypothetical constructs" in order to apply them to theories of learning, the neobehaviorists (like the cognitive psychologists) created metaphors, analogies that allowed them to create more sophisticated perspectives of human learning. Because of their *disengagement* from any comparisons even remotely connected with animals, these researchers developed more sophisticated analogies based on one of the most accessible and powerful knowledge technologies available—the computer. These "computational" analogies even "influenced postbehaviorist cognitive psychology" (Greenwood, 1999, p. 6) and have even been so pervasive in instructional design, that it has only been in the last few years, as research on the physiological processes of learning in the human brain have become more accessible, that we have begun to realize that our brains are less like computers and more like jungles in their complexity and interconnectedness (Reardon, 1998/1999, Abbott & Ryan, 1999).

Although still behavioral, this new notion of "knowledge acquisition" viewed knowledge as "a commodity that can be transmitted directly from teacher to learner" (Mayer, 2001b, p. 42). Unlike Thorndike's assertion, the teacher is not simply a dispenser of rewards based on a student's response to information; the teacher is the repository and dispenser *of* that information; not only does the teacher *affect* the response, the teacher *controls* the reality of the stimulus itself. Students certainly have more conscious control over their responses than they were given credit for in response-strengthening (connectionist) theory, but they still do not determine the ultimate meaning, value, or truth of the information nor do they reflect on their own processes that led them to their responses. Even though they are now more involved in the process of strengthening or weakening their connections to information (recognizing the theoretical existence of "intervening variables"), the goal is still simply the additional acquisition of

information (Mayer, 2001b, p. 39). This is why some researchers and critics argue that knowledge and skill acquisition, albeit legitimate forms of learning, are not necessarily the most significant elements of learning (Mayer, 2001b, p. 42).

It is with this view of knowledge acquisition that one of the fundamental shifts in how psychologists and even educators view learning occurred. Instead of seeing learning as a change in behavior, which is what a basic stimulus-response theory like Thorndike's connectionist theory posits, psychologists and educators began to re-define learning as "a change in knowledge that must be inferred from changes in behavior" (Mayer, 2001b, p. 39). This change in perspective occurred for two reasons. First, this view recognizes that behavioral change is not necessarily, in itself, a goal of learning. Instead, behavior becomes the signal of something that is going on *inside* the learner. The assumption is that since a change in knowledge (learning) is not always visible, because it has to be *inferred* from behavior, then, logically, behavior is only a coarse gauge of learning at best, and can be a fallible gauge at worst. This recognition of learning as more than just a rote response was fundamental to the contemporaneous development of cognitive psychology as well as later developments of constructivist theories of learning. Secondly, this recognition of the separation between intrinsic knowledge change and extrinsic behavior establishes one of the fundamental elements for subsequent multi-dimensional learning theories that will include emotional and social intelligences.

At the same time the behaviorists were focusing on measuring learning as behavior, other psychologists were focusing on the neobehaviorists' "intervening variables" and "hypothetical constructs" as the true measures of learning. It is important to remember that even though these "cognitive" psychologists focused on internal (cognitive) processes of concepts, beliefs, memory, and perceptions as integral to learning, they still believed, as the neobehaviorists did,

that learning was the appropriation, processing, and storing of information—learning as knowledge acquisition. Also like the neobehaviorists, cognitive psychologists *did* understand that observable behavior was related to learning. However, unlike the neobehaviorists (and behaviorists in general), cognitive psychologists believed 1) cognitive processes were the true measure of learning, 2) these processes were the basis of observable behavior, and 3) these processes were measurable (Greenwood, 1999).

Although the elements of "intervening variables" and "hypothetical constructs" in neobehaviorism certainly influenced the rise of cognitivism, early cognitive psychology (often referred to as "structuralist psychology" or "structuralism") was also based on previous ideas of consciousness and cognition, including those of David Hume at the beginning of the 18th century, and even going as far back as John Locke at the end of the 17th century. Hume posited that consciousness actually takes two distinct forms. One form comprises forceful perceptions that he called "impressions." These impressions are forceful acts of cognition that we often define as passions and emotions. The second form is what Hume called "ideas"—perceptions that are less forceful, less passionate than impressions, and are the substance of our reasoning and thinking (Greenwood, 1999). Locke viewed consciousness and thinking as inseparable, believing that when we perceive, we also are conscious that we *are* perceiving. In a prefiguring of the contemporary view of metacognition, Locke believed that whenever we think, we are *aware* we are thinking.

Influenced by these earlier ideas of consciousness and thinking, and based on their own research, structuralists like Wundt and Titchener believed in two essential elements of cognition. First, what Locke would call "impressions" and (especially) "ideas" are, according to structuralists, essentially imagistic in nature. In other words, when individuals perceive ideas

and concepts, they *see* these concepts in their minds, or, more precisely, they see an image that represents these ideas or concepts. Second, instead of these images occurring unconsciously, many structuralists believed that individuals are completely aware of these images when they engage in cognitive processes such as creating insights and understanding (Greenwood, 1999).

It is this second characteristic of structuralist cognition that eventually led to an almost total disregard of structuralist psychology and why it does not figure in contemporary learning theory. Subsequent cognitive research revealed the fact that many people create understanding, insights, even meaning *without* being conscious of any aspect of their cognitive processes, which include the creation and use of conceptual images. In fact, much of the cognitive research that has occurred since the 1950's has concluded that even though many individuals *are* conscious of their cognitive processes (including image creation), this form of introspection (which we now identify as "metacognition") is not only limited but should not be considered an essential element of cognition (Greenwood, 1999). (This notion of metacognition and introspection as essential to learning will become a focus of learning theory in the late 1980's, just as its efficacy will be challenged in the 1990's [Bandura, 1993; Zimmerman, 1995]). The structuralist, then, measured "growth" and "learning" by measuring changes in both how information is acquired and how that information is change once it is acquired (as opposed to the behaviorists who measured learning by changes only in behavior). Still a "knowledge-acquisition" view of learning, structuralists believed these changes were a result of deeper, less observable changes in cognitive structures, including the organization of those structures.

In the late 1940's, cognitive psychologists began to understand the limitations of the structuralist views of cognition. Besides research conclusions that indicated the limitations of conscious image construction in cognitive processing, the structuralist view was also unable to

account for more complex cognitive process like language (Greenwood, 1999). Instead of arguing that language was a direct result of cognition (and, by implication, the conscious creation and manipulation of concepts), most structuralists reverted to previous behavioral explanations of language as a result of associative behavior—that we learn language because we develop the habit of associating a certain label (word) with a specific stimulus. In response to these limitations of structuralist theory and their willingness to reexamine earlier descriptions of the relationship between consciousness and cognition, many psychologists began to ask different questions about how individuals respond to stimuli and what affects their acquisitions of knowledge. This was the birth of developmental cognitive psychology.

The developmentalists, like the structuralists before them, believed in discreet cognitive processes that affected the perception, acquisition, and storage of knowledge; they also believed that these processes were the result of response to stimuli. What separated them from their contemporaries was not just the notion that individuals (in this case, mostly children) consciously apply a variety of cognitive processes in their acquisition of knowledge (thus refuting the view of associative learning as a primary mode of learning); they also believed that this application is *developmental*—it not only comprises distinct characteristics at different ages and is a product of natural biological evolution, but these processes become progressively more complex in nature with age and practice. Instead of viewing learning as simply changes in knowledge acquisition, cognitive psychologists began to define learning as changes in both the nature *and* the level of content in cognitive structures and processes. For the next twenty years, developmentalists refined and tested their theories, with their research confined predominantly to the study of cognitive development in children. Although developmental theory began to affect learning theory and even the budding field of educational psychology, it wasn't until the 1960's that

developmental psychology all but supplanted earlier structuralist and neobehaviorist views of cognition. This invasion of cognitive psychology was represented by a man whose name would become synonymous with developmental psychology—Jean Piaget.

Piaget's research on child cognitive development spanned almost 40 years, from the 1930's to the 1970's, and his contributions to the field were immeasurable. Although his work was focused entirely on cognitive development in children, the questions that were the basis of his research and theories have also become the basis for research into adult learning. Some of the questions he asked, questions fundamental to the overall study of cognitive psychology in his time, were:

1) What cognitive-making equipment is a child born with? (A faint nod to the ides of cognition and consciousness posited by Hume and Locke)
2) What role do interactions with the environment play in a child's development?
3) Are there invariant developmental sequences and, if so, why are they invariant?
4) What are the mechanisms or processes that cause cognitive development to occur?

(Flavell, 1996, p. 200 Ginsburg & Opper, 1978)

In answering these questions, and influenced by both the Gestaltists and the behaviorists, Piaget defined the field of developmental psychology. Although agreeing that learning can be measured by change, the changes he focused on were cognitive—changes in an individual's cognitive structure that are "a result of the organism interacting with the environment [*and*] being exposed to an increasing number of experiences" (Merriam & Caffarella, 1991, p. 129; Doolittle, 2001; Darkenwald & Merriam, 1982). One of his most profound contributions was his *assimilation-accommodation* model of cognitive growth. In this model, Piaget posited that cognitive development is a slow, step-by-step process of growth whereby a child *selects* input from stimuli

that is meaningful, *assimilates* the input, and then, *interprets* the input based on her distinctive cognitive structures. The result of this interpretation of the input is an accommodation (adaptation) to her environment (Flavell, 1996). Repeating this process of assimilation and accommodation leads to a refinement in both the selection and interpretation of stimuli; this refinement becomes one measure of cognitive growth/learning (Ginsburg & Opper, 1978).

For Piaget, cognitive growth in a child is a process of maturing through four distinct cognitive stages. Each of these stages is represented by different ways of making meaning of the world. Although influenced by environment and the individual's physical brain structures, every child goes through each of these stages to some extent:

1) sensory-motor stage (infancy) in which the child is simply reacting to the stimuli in her environment; behavior is based on innate reflex actions
2) preoperational stage (toddler and early childhood) in which the child can articulate concrete concepts in words and symbols
3) concrete operational stage (elementary and early adolescence) in which the child begins to form *concepts* and understand that there are relationships between ideas
4) formal operational stage (adolescence and adulthood) in which the individual can learn to hypothesize and logically reason

(Merriam & Caffarella, 1991, p. 182; Piaget, 1977).

Piaget concludes that this fourth stage occurs sometime between the ages of fifteen and twenty, which is why this stage is often used as a starting point for many developmental psychologists who study adult cognitive growth and learning. In this stage, the individual is searching for "'fundamental fixed realities—basic elements and immutable laws" that many researchers of

adult learning view as the basis for schema building and reality construction in adults (Merriam & Caffarella, 1991, p. 184; Piaget 1977; Ginsburg & Opper, 1978).

In this model, not only does the individual's cognitive processes affect the collective and storage of input, and not only is the individual conscious that these process are operating, she actively selects aspects of the input that are meaningful and then uses that meaning to adapt to the environment. Piaget's assimilation-accommodation model was the beginning of the constructivist view of cognition and learning that would come to dominate education in the 1980s and 90s—individuals consciously and actively construct meaning.

An even more constructivist explanation of cognitive development is Piaget's model of *equilibrium*. In this model, development results from an equilibrium that is established when a previous equilibrium at a lower level of development is challenged by contradictory or inexplicable stimuli. In response to this challenge, the individual reinterprets the stimuli so that it makes sense in relation to her existing cognitive structures. This reinterpretation (learning) results in a new equilibrium—an equilibrium at a higher level of cognitive development (Flavell, 1996; Piaget 1977). Now, not only does the child actively *select* stimuli that are meaningful, she can actually *change* the meaning of the stimuli that is selected.

Piaget was also the psychologist who gave us one of the more enduring aspects of current educational theory—the development of schema. Piaget's notion of "scheme" or "schemata" argues that children search for objects that they can use to practice their newly developed "schemes" of interpretation and assimilation (Flavell, 1996; Ginsberg & Opper, 1978). These schemes operate as cognitive structures that determine how an individual will react to the environment (Blanton, 1998). An example of this model would be an individual seeking the *opportunity* or *situation* that would require her to count, like spending money, in order to

practice her newly acquired "scheme" of counting. *Objects*, then, are often nothing more than experiences that allow the exercising and reinforcing of cognitive processes. These new objects then become part of the cognitive structures the individual uses to adapt and/or create equilibrium—they become part of an ever-growing base of schemata that continuously become richer and more complex. Although children consciously seek out these practice objects (practice *experiences*), they do not necessarily consciously apply the results of this practice to their learning. In other words, once these experiences are assimilated, they become part of the larger, often unconscious, cognitive processes (Piaget, 1977; Piaget 1972). In current adult learning theory, this notion of schema is expanded to include almost any experience or learning that the learner can *consciously* bring to bear on a specific learning task. This *conscious* use of schemata (experiences) is one of the main differences between the way adults learn and the way children learn.

Piaget also argued that children's "cognitive behavior" is motivated intrinsically rather than extrinsically. He believed that adaptation and the processes that lead to it are actually biological, that "adaptation is something organisms have evolved to do" (Flavell, 1996, p. 200). Although this view is more Darwinian at its core than later theories of biologically-based cognition (like brain-based learning theories that are just now being developed), Piaget's notion of biologically-evolved adaptation prefigured these theories.

Although Piaget's theories and models of cognitive development have arguably become the cement in the foundation of contemporary cognitive psychology, there have been many extensions of his models and development of competing models of developmental psychology that have affected current adult learning theory. Erik Erikson, a contemporary of Piaget, was one of the first to suggest that emotional development continued well into adulthood (Wambach &

Brothen, 2000). He referred to his eight stages of human development as "psychosocial stages because they are characterized by social conflicts (relational conflicts) that must be resolved by the individual:

1) Trust vs. Mistrust—the infant (0-1) is totally dependent. If needs are met, the infant learns to trust. If needs are not met, the infant will develop a mistrust of people and the environment.
2) Autonomy vs. Doubt (or shame)—the toddler (1-2) begins to develop independent behavior. If encouraged, independence and self-esteem will continue to grow. If discouraged or disapproved of, the child will remain dependence and also a likelihood of developing shame and low self-esteem
3) Initiative vs. Guilt—the young child (2-4) has more advanced motor skills and is more adventurous. If encouraged and consistently disciplined, the child will develop sense of responsibility and continue to develop imagination and creativity. If discouraged, the child might learn to feel guilty about being independent.
4) Competence vs. Inferiority—the early school-aged child (6-12) places great importance on school. The child develops skills and begins to think about transitions to the workplace. Encouragement and support increases the likelihood the child will find value in intellectual activity. If not encouraged and supported, the child could develop significant feelings of inferiority.
5) Identity vs. Role Confusion—the adolescent (12-18) begins questioning her sense of self. She develops the ability to reflect on her past in an effort to reconcile earlier conflicts in an effort to define herself. If she is successful, she enters adulthood with a strong identity, a

strong sense of self. If she is unsuccessful, she enters an "identity crisis" and might develop the inability to make decisions regarding sexual orientation, vocation, and role in life.

6) Intimacy vs. Isolation—the young adult (19-40) focuses on love relationships and develops both a desire and capacity for intimacy. If successful, she develops close relationships with others, which support her sense of identity. If she is unsuccessful, she has difficulty trusting others and often becomes isolated.
7) Generativity—the middle adult (40-65) develops the ability to look outside herself and care for others, generally the subsequent generation (through parenting, teaching, or other involvement in the lives of younger people). If she cannot resolve this conflict, she often begins to stagnate in life and solidify her self-centeredness.
8) Integrity vs. Despair—the old adult (65-death) reflects on her life to see it filled with pleasure and value or despair and regret. If the individual achieves a sense of fulfillment, she accepts the last years of her life with dignity and integrity. If she does see her life as fulfilling, she will fall into despair and fear.

Erikson's model suggests what many humanist psychologists suggest—that learning is *one* element in the process of development. Also, individuals continually seek (unconsciously as children, more consciously as adults) a less stressful, more challenging, higher quality of life, and they create meaning and make choices based on that meaning in response to situations that they believe are significant in that search. Erikson's arguement that development is the result of conflict resolution (or lack of it) confirms later theories about how the brain creates neural connections resulting in meaning in order to survive.

Other researchers interested in considering the existence of developmental stages in adults also began to theorize that even certain aspects of cognitive development might also

continue into adulthood. Many of these extended and competing models were a result of gaps that researchers found in some of Piaget's models, especially in relation to the way adults learn. There were several issues in Piaget's research that these researchers attempted to address:

1) Rather than cognitive development occurring in general, sequential stages, it began to appear that this development was more related to specific subject areas.
2) This conclusion was a result of a body of research that consistently showed that children had certain "cognitive abilities" earlier than Piaget had suggested, especially in certain subject areas.
3) Research was also consistently showing that babies had, already, fairly complex "abstractions" of the world.
4) It soon became apparent that Piaget's assimilation-accommodation model, although an appropriate description of conscious knowledge acquisition, was too vague in its explanations of the diverse elements of new constructivist theories.
5) Explanations of children's cognitive development were not easily transferred to adult cognition, meaning construction, and learning. (Gopnik, 1996, p. 221)

The move to apply cognitive developmental models to adult subjects resulted in more clearly defined explanations of knowledge/meaning construction that were central to Piaget's models of child cognitive development and redefined Piaget's developmental psychology as just one aspect of cognitive psychology. In the 1970's, the march toward adult constructivist theory was at full steam.

These theories of adult cognition, growing out of the developmental approach, can be grouped into several general areas of cognitive development, knowing, and learning:

1) Modular theory: Understanding of the world is not the result of structures created from evidence (experience). Rather, it is the result of innate structures (modules), and once these modules are stimulated, the resulting representations are set and cannot be influenced or altered. Experiences (schemata) can trigger these representations, but schemata (and by implication, the individual) cannot alter the structure of these representations (Gopnik, 1996; Mayer, 2001a).
2) Schema theory: Similar to Piaget's notion of "schemata" in children, this theory is based on what Jerome Bruner calls a "mental map" (Blanton, 1998). In children, these "maps" are both constructed and used much less consciously than they are in adults. Adults can actually 1) become aware of the existence of their schemata/maps; 2) evaluate their quality; 3) modify them; and 4) apply them consciously in learning events. These maps are ways that learners organize their worlds, determine how experiences are processed, and, thus, become a basis for the creation of meaning (Merriam & Caffarella, 1991, p. 130).
3) Information Processing theory: Instead of focusing on how minds come to create representations of the world, information processing research focuses on *how* we put these representations to use and how we manage them, not just how we construct them. Instead of focusing on the products of learning, an information-processing approach focuses on the processes we use to create those products (Blanton, 1998). Our effective use of these representations does change over time (a vague similarity to Piagetian stages of development), but because the focus is on how these representations are applied, information processing theory has a more direct application to adult learning than any developmental model because of adults' ability

to consciously control many aspects of their information processing (Gopnik, 1996; Lawton & Saunders, 1980).

4) Social Construction theory: Although most researchers agree that social interaction cannot account for fundamental changes in concepts, they do argue that social interaction plays a much larger role in cognitive development that originally thought—we learn from observing other people (Merriam & Caffarella, 1991, p. 134). This is especially true when the concept being learned or changed is not fact-specific, like a mathematical equation or a specific grammar rule (Gopnik, 1996); in a social situation, others can introduce, highlight, or interpret new evidence (stimuli, information, conditions, situations) that can influence how an individual uses that evidence. Social interaction seems to be most effective in concept formation/change when the concept is more general, broader, such as a critical thinking process of *approaching* an equation or an overall understanding of how grammar affects writing. A specific form of this type of theory is argued by Lev Vygotsky who argues that culture and social environment are the primary sources of human development, and consciousness is a direct result of socialization He sees language as the framework in which this development takes place (Doolittle, 2001). It is interesting to note that recent research into the neurocognitive processes of the brain have confirmed the importance of social interaction in concept formation and learning.

5) Specialized Groups theories: These theories are specific forms of social construction and social learning theories. One of the most significant of these theories (influenced by William Perry's theories of epistemological development as well as

constructivism) is one that argues that women are socialized to perceive knowledge in one or more of five ways:

a. silence—almost complete disconnection from any knowledge that could be used to define self. Characteristics include feeling deaf and dumb, experiencing disconnectedness, obeying wordless authorities, feeling compelled to maintain a "woman's place" in the world, inability to describe/define self, and feeling invisible.

b. received knowledge—knowledge is dualistic (either right or wrong) and originates outside the self. Characteristics include listening as a way of knowing (listening to friends and listening to authorities); men are the authorities because they are the "knowers"; distrust of intrinsic moral guidelines (or viewing the reliance on intrinsic moral guidelines as resulting in harm to others, to society); and definitions of self are derived from social expectations (often leading to the development of a "selfless" self).

c. subjective knowledge, the inner voice—knowledge and truth are still dualistic but are now intrinsic. Characteristics include redefining the nature of authority as internal, thus the development of personal (subjective) perspective and voice; and truth is more an instinctual reaction rather than a conscious construct; an often reactionary leap toward situations and events that put them first (new occupations, attending school); significant attempts at self-redefinition that often result in instability because of the lack of grounding and experience with self-definition; and the visible constructions of optimism and self-value.

d. procedural knowledge, the voice of reason—seeing oneself as an object within a larger process of knowledge/meaning construction. Characteristics include the development of reason and empathic understanding—development of intimacy with the object of discourse.

e. constructed knowledge, integrating the voices—all knowledge is contextual. Characteristics include the development of an authentic voice, experiencing themselves as creators of knowledge, and the valuing of "both subjective and objective strategies for learning"

(Merriam & Caffarella, 1991, pp. 192-3; Belenkey, Clinchy, Goldberger, & Tarule, 1986)

6) Scripts and Narratives: Instead of representations of the world being highly structured, they are the result of more loosely structured generalizations that form sequences of action. The influence of these narratives derives from the causal relationships between the elements in the sequences or even because the elements, like a narrative, simply follow each other in the sequence. Individuals, then, develop cognitively when they combine less sophisticated narrative representations with other scripts creating even more sophisticated narratives (representations of the world) (Gopnik, 1996; Lawton & Saunders, 1980)

7) Human Motivation (humanistic) theory: Originated by Abram Maslow, humanists believe that individuals are in utter control of their own behavior. In direct opposition to behaviorists, humanists believe that behavior is a result of choice, and, therefore, "people possess unlimited potential for growth" (Merriam & Caffarella, 1991, p. 132). Humanists believe that people are innately good and possess the ability to

achieve a positive quality of life—in fact, they are drawn to this process (Darkenwald & Merriam, 1982). A humanist would argue that learning results from the combination of perceptions that are grounded in experience and an individual's "freedom and responsibility" to become what they are capable of becoming—people learn because they have a desire to learn (Merriam & Caffarella, 1991, p. 132). The application of choices to/within learning events (the motivation to choose) depends largely on what the individual *needs* (desires) from that event. These needs are physical (biological), emotional (affective), social, and psychological (cognitive) and form the basis for intrinsic motivation. According to Maslow, this intrinsic motivation to learn is based on a "hierarchy of needs" that are grouped into three categories:

a. physiological needs: hunger, thirst
b. security needs: security and protection (shelter)
c. social needs: belonging and love, self esteem, respect
d. self-actualization—the ability to use accumulated knowledge to define a sense of self (Darkenwald & Merriam, 1982, p. 79)

In fact, Maslow argues that self-actualization is the primary goal of learning and *that* should be the focus of educational design. He also suggests other goals of learning that include the discovery of a vocation, the realization of life as precious, a sense of accomplishment, the control of impulses, and learning to make wise choices (Merriam & Caffarella, 1991; Darkenwald & Merriam, 1982; Maslow, 1970). More importantly, Maslow situates these needs in a hierarchy because not only can they be differentiated from each other as far as the type of need they signify but, more importantly, they can be

differentiated from each other by how they influence personal motivation. In relation to both the extent and quality of that motivation:

a. The higher need is a later evolutionary development. We share the physiological needs with animals, the security and social needs with other humans, and the need for self-actualization with no one.

b. Higher needs are later "ontogenetic" developments. We tend to have only the lower needs as babies, and as we development, we also develop the higher needs.

c. The higher the need, the less imperative it is for sheer survival, the longer the gratification of the need can be postponed, and the easier it can disappear.

d. Living at a higher level of need means living at a higher level of biological efficiency, well being, and quality of life.

e. Higher needs are less urgent because they are less discernible from lower needs. It takes much more work to identify higher needs than lower needs.

f. The gratification of higher needs results in more desirable results including happiness, serenity, and personal value.

g. Pursuit of higher needs represents healthy life-trends.

h. The higher needs require the satisfying of more preconditions; there are more activities and often people involved in the satisfying of higher needs

i. The satisfying of higher needs requires better environmental conditions (e.g., economic, academic, familial).

j. Greater value is placed on higher needs once they have been gratified; people are more likely to give up more to satisfy those needs if they have been satisfied in the past.

k. The higher the need level, the greater the degree of love-identification. Individuals who seek to satisfy higher level needs often do so in relationships where their needs and the other's needs are indiscriminately perceived.

l. The pursuit of higher needs has positive social consequences. Generally, the higher the need, the less selfish it is, the less egocentric it is, the more likely the pursuit of its satisfaction will include others.

m. Satisfying higher needs is closer to self-actualization than satisfying lower needs.

n. Satisfying higher needs leads to a truer sense of individualism

o. Lower needs are more tangible and finite. In other words, hunger is often more physically discernible than respect, but it also has a finite level of satisfaction—you can eat until you are full. However, the need for respect (and love or intellectual satisfaction) is almost limitless. (Maslow, 1970, pp. 98-100)

Most humanist theories of learning and education consider self-actualization a worthy goal; however, beyond the belief that it involves the development of a sense of self, it is usually a nebulous term we use to describe some enlightened state of being. Maslow, however, is careful in describing several characteristics of the self-actualized individual. Self-actualized individuals:

- have a more efficient perception of reality and are more comfortable with it

- accept themselves, others, and their surrounding environment (are not crippled or held back by inconsistencies or contradictions within these domains; are more concerned with growth rather than deficiency)
- are spontaneous and their behavior is natural, simple in the fact that it lacks artificiality and pretentiousness
- focus on problems outside themselves, more concerned with values that are broad and not petty, uses introspection as a way to learn how they fit into and can affect the world rather than on self-incrimination and self-loathing
- have a need for privacy and are comfortable in themselves to the extent that they do not have to be surrounded by others all the time in order to gain a sense of purpose or value
- are autonomous from physical and cultural environment in that they derive their meaning and value from within, their sense of who they are
- possess an ability to appreciate things as always being new, fresh, and see the world and themselves with awe and pleasure
- have a deep feeling of identification, sympathy, and affection for others (*gemeinschaftsgefuhl*)
- have deeper and more profound interpersonal relationships
- are democratic in nature in that are more attracted to the character of another person rather than that person's class, race, educational background, or political belief
- can discriminate between means and ends as well as good and evil

- are creative, which is usually observable in an activity (or activities) they prefer to engage in as well as the way they approach activities, events, and situations
- resist meaningless enculturation, preferring instead to pattern their life after values they have assessed as important rather than philosophical, political, economic, literary, psychological, or even religions fads or trends

(Maslow, 1970, pp. 153-173)

8) Personal Growth: A variation of humanistic learning theory, this approach argues that significant learning can be defined as learning that leads to personal growth and development. It has five distinct characteristics: a) both affective and cognitive elements of the individual are involved; b) the desire to learn must be intrinsic; 3) the resulting learning is pervasive—it affects behavior, attitudes, thoughts, feelings, even personality; 4) the learner is the best judge of whether or not the learning has met her need; 5) learning occurs in the context of experience and the learning "becomes incorporated into the total experience." (Merriam & Caffarella, 1991, p. 134)

9) Intellectual Cultivation: Unlike the humanists who argue that some of the goals of learning (and, therefore, on of the main goals of education) include self-actualization (the development of a distinct and supportable concept of self), preparation for people to improve the quality of their lives, and in more radical interpretations, social change, some philosophers and educators believe that education should be valued for its own sake. They believe that when we connect educational goals with social values, we attenuate education's ability to develop higher levels of reason and intellect because the system has been politicized—forced to derive itself from a

general social agenda. Education should be the one place where socialization ends and the development of an objective critical mind, devoid of non-intellectual influences, begins. Although many of these theorists argue that education has social value (in that it is regarded by the society as having *intrinsic* value), they argue that education should not be used to fulfill social ends. Education should not have to be justified based on how individuals will use their education in service to the society but on how it develops the "cognitive, rational, and intellectual" domains of those individual. The teaching of skills is certainly a legitimate activity within adult education, but the focus should be on a more liberal arts approach that transfer "neutral . . . publicly accredited, socially worthwhile" knowledge (Darkenwald & Merriam, 1982, p. 45). Learning is teacher-centered because it is up to the teacher to decide what is valuable or not, and the goal is the development of rationality.

10) Differentiation between Meaningful and Rote Learning: Learning is meaningful "only when it can be related to concepts that [already] exist in a person's cognitive structure" (Merriam & Caffarella, 1991, p. 130). David Ausubel argues that because this learning is linked not just to previous experience (schema) but *concepts* (themselves meaningful constructs of cognitive processing) previously created from those experiences, the learning is more likely to become embedded in long-term memory. In fact, new knowledge is only processed insofar as it can be connected to previously created concepts. This notion of "reception" learning is intimately linked to schema theories of learning that play a significant role in the development of adult learning theories because one of the significant differences between the way adults and children learn is that adults approach learning events with a wealth of experience

that children do not possess. Finally, Ausubel argues that rote learning is learning that does not become linked to concepts and, therefore, is more likely to be forgotten (Merriam & Caffarella, 1991, p. 130; Lawton & Saunders, 1980; Darkenwald & Merriam, 1982).

11) Discovery: Unlike Ausubel who argues that learning is the result of connection, Bruner argues that learning is the product of discovery. He defines discovery as "a matter of rearranging or transforming evidence in such a way that one is enabled to go beyond the evidence [. . .] to additional insights" (Merriam & Caffarella, 1991, p. 130). Discovery involves acting on potential—in consciously (and often unconsciously) manipulating knowledge, the individual creates potential for insight and, eventually, develops new insight from this potential. Discovery-based learning involves three processes: a) acquiring new information; b) manipulating the information to fit new tasks; c) evaluating whether the manipulated information can be applied to the task. Discovery learning is similar to later constructivists theories that will suggest learning is a product of knowledge acquisition, processing (manipulation), and evaluation resulting in the construction of meaning (Merriam & Caffarella; Lawton & Saunders, 1980).

12) Dialectic Thinking: Not all researchers shared Piaget's belief that higher levels of thinking were only arrived at as the individual passed through his four stages of development. These researchers, like Klaus Riegel, focused more on how adults learn and believed that these higher level thinking skills were not a matter of development as much as a willingness to examine and accept the contradictions (dialectics) and ambiguities that are more apparent in an adult world. In dialectic

psychology, cognitive processes moved back and forth across developmental stages (instead of vertically as Piaget argues) in order to create some sense of momentary stability out of these contradictions. The bases of "mature thought" are the a) recognition that paradox, contradiction, and ambiguity exist, and b) acceptance that their existence is the "'basic property of thought and creativity'" (Merriam & Caffarella, 1991, p. 184).

13) Developmentally Dialectic: Rather than a specific theory, this model is actually a combination of Piaget's developmental learning and Riegel's notion of dialectic thinking. In his work with college students, William Perry offers an adult learning model that contains characteristics of hierarchical and sequential stages similar to Piaget's model. Each of these stages, like Piaget's model, represents different and increasingly more complex ways of "perceiving and evaluating knowledge" (Merriam & Caffarella, 1991, p. 190). In general, Perry argues that as adults move through several stages of knowledge perception--from viewing knowledge as dualistic, being either right or wrong, to higher-ordered thinking in which they view knowledge more relativistically—the context of the knowledge is just as important as the content. This ability to recognize and understand the contextual nature of knowledge is the framework in which we develop the understanding of multiple perspectives. What is even more significant about Perry's stages is that they also predict a transition from epistemological dependence (believing that the authorities who control and dispense knowledge also control and dispense the truth) to epistemological independence (realizing these authorities do *not* always tell the truth, that the ability to *know* the truth is actually intrinsic) (Belenkey, Clinchy, Goldberger, & Tarule, 1986, pp. 9-10).

The transition from dependence to independence is what makes Perry's model a logical base for many instructional designs, especially those that focus on the development of critical, self-regulatory behavior. Another difference from the Piaget model is that Perry believes that the *transitions* between stages are just as important as the stages themselves—that the stages themselves might simply be "resting points along the way" of development.

Other than modular theory, these diverse theories comprise several common elements of learning, including adult learning:

- Learning occurs when information is both consciously and unconsciously processed to create meaning.
- There are many factors other than unconscious processes that affect the quality and extent of learning, one of the most significant being social environment.
- The quality of learning is related to the significance (depth, where the information is stored, whether long or short term memory) of the connection between the event/information and experience *and* how that significance is perceived.
- Adult learning is the result of a choice made by the individual.

In the wake of Piaget, these theories lead us to the doorstep of what is arguably the most influential theory of knowledge (acquisition, manipulation, meaning-creation) as it applies to adult learning--constructivism

Summary of Pre-Constructivist Theories

In both the behaviorist response-strengthening and more cognitive knowledge-acquisition theories, "learning" is measured by changes in behavior (performance), but "meaning"

(including understanding) is not a measured component of the process. In addition, since the response-strengthening (stimulus-response) research that supported behaviorism was based almost exclusively on animal experimentation and has been virtually impossible to reproduce with human subjects, the learning theories that have resulted from these views are marginally applicable to adult learning, at best. Enter the cognitivists who began arguing that although learning could be measured by observable behavior, behavior itself was *not* learning. For the cognitivists, learning was a result of complex cognitive processes such as perception, insight, and understanding that the individual was not only aware of but could manipulate to a certain extent. Then, the developmentalists added yet another stitch to the fabric by arguing that not only were these cognitive processes complex and somewhat accessible, they were the result of interactions with the environment and the individual's attempt to accommodate to that environment. In addition, these processes become increasingly more complex over time and are actually the result of innate biological processes.

Educational psychologists since the 1950s have always been interested in how these theories of consciousness, cognition, and knowledge acquisition could be applied to instruction. Although it might appear there is an obvious application between theories of thought and instructional practices, there is actually quite a gap between them. First, research into cognition does not always yield sound theory; theories of cognition do not readily imply theories of learning; theories of learning do not necessarily imply theories of instruction; and theories of instruction do not automatically translate into instructional practice (Jensen, 2000; Caine & Caine, 1990; Miller 2003).

It has been the need to create these connections between research, theory, and instructional practice that have caused the growth of educational psychology, an often orphaned

child of cognitive psychology. However, in the last quarter century, educational psychology has found its own voice as it has attempted to synthesize an ever-growing body of research, especially in adult learning. This synthesis has primarily focused on three dominant areas of learning research/theory: 1) cognitive psychology, specifically constructivist learning; 2) non-intellective learning; and 3) cognitive neuroscience (brain-based learning).

Constructivism

It is in the latter part of the 20th century that psychology, learning theory, and education finally wed, forming a more "perfect union" so to speak. Fathered by the cognitive developmentalists, the child of this union is the "knowledge construction" (constructivist) view of learning. According to this view, knowledge is no longer a discreet entity that can be handed from teacher to learner; learning is not measured simply by changes in behavior or development. Instead, students learn by *constructing* meaning in "the active creation and modification of thoughts, ideas, and understandings as the result of experiences that occur within a socio-cultural context" (Doolittle, 2001). Constructivism is a broad theory that is often referred to by various interpretations including generative learning, problem-based learning, reciprocal teaching-anchored instruction, and situated cognition (Doolittle, 2001). However, to put it simply the constructivist student:

1) *selects* what is relevant from the information presented by the teacher;
2) *organizes* the information into a coherent form;
3) *integrates* this form with existing knowledge; and
4) *reflects* on her own participation in the process in order to guide future meaning-making events (the creation of "insight"). (Mayer, 2001b)

This process is "learning"; as a result of this process, the student creates an individual understanding of the information in question. This understanding is "meaning"—not just concept formation but the creation of meaning based on a concept; learning involves not just the acquisition and manipulation of knowledge, but the *understanding* of that knowledge. Understanding is often measured by the ability to both explain knowledge and apply it in other contexts. Although this view is a radical departure from the previous views of learning, it was not without precedent at the time. From the early part of the 20th century, learning theories, like most psychological theories, were dominated by behaviorists and their rather stringent stimulus-response theories that denied the role of cognitive (intellectual) processes in learning (Mayer, 2001b). However, at the same time, Gestalt psychology was touting the importance of insight, perceptions, and understanding while learning theorists like John Dewey were arguing that "'learning is . . . problem-solving'" and should be based in experience (Mayer, 2001, p. 43; Claxton & Murrell, 1987). All of these elements are synthesized in the knowledge-construction (or more accurately, *meaning*-construction or *constructivist*) view. Although constructivist techniques take many forms, constructivism, in general, comprises several characteristics:

Teacher

1) The teacher becomes a guide who helps the learner engage in the learning process (Mayer, 2001b; Doolittle, 2001).
2) The teacher can stimulate the learning process, but the student is the active learner, not the teacher (Mayer, 2001b).
3) One element of authenticity is that the teacher provides scaffolding (prerequisite knowledge and practice) and feedback during the process (Mayer, 2001b; Diaz-Lefebvre, Siefer, & Pollack, 1998).

4) Instructional decisions made by the teacher are based upon the teacher's understanding of the student as a learner (Mayer, 2001b).

5) The teacher should provide for and encourage multiple perspectives (Doolittle, 2001).

Learner

6) Rather than simply gaining new information, the student creates (constructs) meaning and, thus, new knowledge. It is not enough for students to simply take an active role in acquiring knowledge; real learning (including understanding) results from learners re-creating knowledge—discovering for themselves (Blanton, 1998; Doolittle 2001; Mayer, 2001b; Perkins, 1999).

7) This re-creation involves many "internal processes," including emotions, and results in several forms of knowledge including "verbal information, intellectual skills, cognitive strategies, attitudes, and motor skills" (Mayer, 2001b, p. 44; Salovey & Mayer, 1997)

8) This re-creation also involves the learner's use of prior knowledge (schema) (Doolittle, 2001).

9) The learner is social—knowledge, meaning, and understanding is a product of dialogue with others (Perkins, 1999; Doolittle, 2001) .

10) The learner is active—instead of just listening, reading, or working through exercises, learners must discuss, investigate, and argue positions (Perkins, 1999).

11) The learner should become self-regulatory, self-mediated, and self-aware (metacognitive) (Doolittle, 2001).

Learning

12) Learning is embedded (contextualized) in authentic tasks that the learner is interested in (Doolittle, 2001).

13) Content and skills should be relevant to the learner (an element of authenticity) (Doolittle, 2001).

14) Learning should be assessed formatively (focusing on development) in order create a basis for further learning (Doolittle, 2001).

15) The study of learning becomes the study of how changes occur in learners (Mayer, 2001b).

Downside

1) takes time (Perkins, 1999)
2) high cognitive demands on students (and teachers) (Perkins, 1999)
3) can appear to be manipulative; students might question why they have to go through all the work—why not just tell them what we want them to know (Perkins, 1999)

Constructivists incorporate these characteristics with their recognition of different kinds of knowledge (especially troublesome knowledge) to create responses to diverse learning situations. Since constructivists are interested not just in the knowledge being acquired but how the individual uses that knowledge to create meaning, they have identified categories of knowledge that can interrupt or at least attenuate the creation of meaning and understanding:

1) Inert knowledge

   Definition: Knowledge that essentially sits in the learners mind unused and unapplied until it is needed, for example in response to a quiz or prompt.

   Response: Involve students in problem-solving activities that allow them to connect knowledge with their personal experience. Another technique would be to involve students in problem-based learning that allows them learn the desired concepts while involved in solving some problem or creating a project. (Perkins, 1999)

2) Ritual knowledge

Definition: Knowledge that is routine, ritualized. It has little or no meaning outside of the context in which it was learned and because it is habitual in nature, its use is usually the result of conditioning, not thought.

Response: Involve students in investigative, problem-based learning where they develop a rationale for the use of such knowledge and understand its use in diverse contexts. (Perkins, 1999)

3) Conceptually difficult knowledge

Definition: Knowledge that cannot be connected to experience or other acquired knowledge. This lack of connection often results in this type of knowledge becoming inert or ritualistic—the student might be able to "learn" (memorize) a response but will have no understanding of either the response or the knowledge that informs it.

Response: Create processes of inquiry and observation that expose the gaps in the student's own theories. An observational approach would be to expose students to "imagistic mental models" or guide them in the creation of their own models. This can be accomplished not only through the facilitation of recreation and discovery but also through simply introducing a concept or principle and guide students through their own testing of the principle. (Perkins, 1999)

4) Foreign knowledge

Definition: Knowledge that is based on a perspective that conflicts with our own.

Response: Facilitate the development of multiple perspectives, such as comparison analyses or role playing (Perkins, 1999).

Other types of knowledge that might prevent or limit understanding include knowledge that is difficult to remember (complex) and knowledge that comprises inconsistencies and paradox. Constructivism has enjoyed a tremendous amount of attention as teachers look for more effective ways to teach, as they begin to realize that the traditional educational system has resulted in severe "shortfalls" in students' learning (Perkins, 1999, p. 8).

The behaviorists measured learning as a change in behavior and believed that what is learned is determined by the environment and not the learner. The likelihood that a learning event will be repeated is a product of how thoroughly it is reinforced—how often in a certain period of time it is repeated or practiced (Taylor, 2001, p. 124). Some aspects that this approach to learning ignores are whether "one needs to perform in order for learning to have occurred or whether all human behavior is learned" (Merriam & Caffarella, 1991, p. 124). Although change is still considered an essential component of the measurement of learning, cognitive psychologists and educators, especially those who support the constructivist view, would add that learning also involves the *potential* for change. One aspect of this potential involves the notion that experiences and consciously controlled cognitive processes can create an intrinsic environment of *readiness* to learn and this readiness is just as essential to learning as the product. The choices an individual makes during a learning event (e.g., self-reflection, how to use emotions, knowledge selection) also creates a potential for related learning that would not otherwise take place without this conscious intervention. For the constructivist then, learning can be viewed as "a relatively permanent change in behavior [*or*] in behavioral potentiality that results from experience and cannot be attributed to temporary body states such as [. . .] illness, fatigue, or drugs." It is also, simply, a "process by which behavior changes as a result of experiences" (Merriam & Caffarella, 1991, p. 124).

Brain Research

Some of the most fascinating, complex, and applicable research about learning has occurred within the last decade. With the advent of advanced technology like the EEG (electroencephalogram), fMRI (functional magnetic resonance imaging) , CAT (computerized axial tomography or computerized x-rays), and PET (position emission tomography) that allow researchers to actually view brain functions in real time, we are beginning to learn more about how the brain learns than we have in the last century (Fishback, 1998/1999; Mayer, 1998). In fact, we have learned more about the brain in the past ten to fifteen years than we have in the previous ninety (Reardon, 1998/1999). What is interesting is that even though this research suggests processes and neuro-events we could only guess at a few years ago, it also corroborates many of the things that psychologists have been telling us about learning for decades. What makes this corroboration even more significant is that this research is being accomplished almost exclusively with adult subjects.

However, it is important to note that brain research (neuroscience) in relation to consciousness, knowing, and learning (cognitive neuroscience) is still in its infancy: Most researchers caution against making sweeping connections between the results of cognitive neuroscientific research and adult instructional pedagogies. This is not to say that there are not strong, significant connections, but those connections, themselves, are the result of further research by educational psychologists. Eric Jensen (2000) argues that brain research should not be applied blindly to instruction, and it cannot justify "every strategy of good teaching." Most good teaching, he goes on to argue, is actually a "collection of basic psychology and common sense refined by trial and error." He does suggest, however, that brain research can "steer us in more productive directions" and make our trials and errors more effective (p. 76).

In the 1960s, early research on learning and the human brain led to several theories about how the brain learns. One of those theories was Dr. Roger Sperry's notion of the importance of "hemisphecity"—the two-sided brain. In his "left brain/right brain" (lateral specialization) theory, Sperry argues that each hemisphere of the brain has specific, localized functions (Reardon, 1998/1999). Specifically, while the left hemisphere specializes in handling stimuli in parts, the right focuses on wholes. The left hemisphere is more adept at sequencing, language, and interpretations; the right is spatial and more random. As interesting as this is, its application to instruction is suspect, and subsequent research has shown that both hemispheres are involved with almost all brain activity (Reardon, 1998/1999; Caine & Caine, 1990).

Subsequent to Sperry was Dr. Paul MacLean's theory of the triune brain. Maclean argues that rather than the brain operating as a dichotomy, it actually comprises three different brains, "superimposed" on each other (Reardon, 1998/1999). The *reptilian* brain (sensory-motor brain) controls voluntary and involuntary processes as well as other basic responses like our flight-or-fight response and other responses we often refer to as "instincts." The *limbic* brain (emotional-cognitive brain) supervises emotions, relationships (both neurological and social), and learning. It is within this brain that knowledge is acquired and stored, where comprehension is accomplished. The third brain is what MacLean calls the neo-cortex (intellectual-creative brain) where higher order thinking processes such as synthesis and evaluation occur (Reardon, 1998/1999; Taylor, 2001). Although subsequent research has suggested that there *is* a primitive state that the brain can revert to when it is stressed or threatened, most researchers agree that MacLean's view of brain activity is unsophisticated at best (Reardon, 1998/1999).

Before describing how learning occurs in the brain, it is important to have a general understanding of the physical processes that support learning. When discussing learning, it is

important to remember that, at its base, it is a physiological process. When students learn, when we educate, the physical structure of the brain—at a cellular level—actually changes. In the brain, there are two types of cells: nerve cells (neurons) and glial cells. The neurons are the information processors, and we cannot grow any more of those than we are born with because neurons lack stem cells that allow for regeneration (Keivipermann & Gage, 2002). (There are very limited cases where neurons in the hippocampus have been stimulated to regenerate, which will be discussed later). The glial outnumber the neurons and support the neurons by providing the nutrients that keep the neurons functioning.

Neurons function as tiny relay stations that send and receive signals to each other. However, the neurons do not actually touch each other in order to transmit and receive. Instead, the neurons use *neurotransmitters* (chemicals like serotonin and dopamine) to complete the exchange. When a neuron receives input, the input travels along the stem of the neuron (the *axon*). Located along the axon are tiny sacks filled with one of over 100 kinds of neurotransmitters. Also located along the axon are *dendrites*, web-like appendages that grow out of the neuron body. Dendrites can also contain the neurotransmitter sacks, but their most significant function is as receptors of the neurotransmitters.

When a neuron is stimulated (*fired*), a specific electrical impulse travels along the axon, reaching these sacks of neurotransmitters and stimulating the sacks to burst open and fill the space (*synapse*) between that neuron (usually its dendrites) and its neighbor with the specific neurotransmitters the impulse is designed to release. The dendrites of the neighboring neuron have dedicated receptor sites that accept specific neurotransmitters like a lock accepts a specific key. When one dendrite accepts a neurotransmitter from another dendrite, a physical connection forms (although a small synapse still exists between them with the neurotransmitter acting as a

kind of glue) and the joined dendrites begin to change. Their length usually increase and they begin to split, forming new spines that share the same neurotransmitter within their synapses. Thus, dendrites actually grow and reproduce as a result of making connections with each other. The accepting neuron then sends this new impulse down its axon and the process repeats. Meanwhile, the sending neuron takes up the neurotransmitter in the synapse, storing it and recycling it for later use. Finally, information itself is stored not in the individual neurons but in the connections made between the neurons via their dendrites (Keivipermann & Gage, 2002; Hardiman, 2003). This electrochemical process of transmission, reception, and connection is the foundation of human thought (D'Arcangelo, 1998).

Since the basis of thought is cellular, there are continuous changes occurring in the neurons, synapses, and dendrites that affect thought and, therefore, affect learning. First, even though neurons cannot be reproduced, dendrites (and, therefore, synapses) have almost unlimited reproductive qualities. Generally, the more stimulation the brain receives, the more dendrites (and possibilities for connections) it creates in order to make connections (D'Arcangelo, 1998; Hill, 2001). (However, we will see later that specific types of stimulation can stimulate dendrite growth while other types of stimulation can actually inhibit it). Second, not only do neurons *not* reproduce, the brain actually begins *pruning* them while we are still in the womb. Neurons that are not used are cut-off; nutrients are no longer delivered to them and they die. This is usually the result of non-use.

For example, someone who is born blind does not use the neurons that were created to process sight. After a period of disuse (how long, researchers are just now beginning to investigate), the neurons die off, never to reproduce. Generally, any neuron that does not attend to information processing is pruned (Hill, 2001). Even though we lose neurons before we are

born, we experience a rapid growth of dendrites in our first ten years or so. At the same time, the brain is conscientiously pruning the unused to make room for new growth. As we age, hormone production lessens and this also aids in the reduction of neurons and dendrites. Dendrites are designed to accept certain neurotransmitters because the hormone related to the production of that neurotransmitter has been reduced, limiting the production of the neurotransmitter itself. Although a large portion of neural pruning is accomplished by the time we are adults, researchers are learning that continued exposure to rich learning environments, strenuous physical activity, adequate lung function, and the absence of chronic disease can actually stimulate dendrite and synapse creation (D'Arcangelo, 1998; Hill, 2001).

Recent research on brain damaged patients has even shown that in very limited cases, neurons can be regenerated. Until just as recently as 1998, brain researchers believed that neurons could not regenerate because they lacked the stem cells that allowed for this "neurogenesis" (Keivipermann & Gage, 2002). However, joint research conducted in both Sweden and the United States (San Diego), revealed that the brain *does* routinely create neurons in one place—the hippocampus. The hippocampus is a small region located in the lower center of the brain that assists in the creation of memory; memory is not actually stored there, but processes related to the creation and storage of memory occur there. This neurogenetic activity was confirmed after it was discovered that patients with hippocampal damage had difficulty processing new knowledge but had little difficulty remembering knowledge they had acquired before their injury (Keivipermann & Gage, 2002). Although this research has no direct, current application to learning theory, it does underscore the fact that brain research is still in its infancy.

The ability of the brain to continuously make new connections underscores the fact that over 100 billion interconnected cells make for an exceedingly complex fabric of human thought,

especially when we consider that these "cells are connected by synapses numbering more than 10,000 times their [the cells'] number" (Hill, 2001, p. 73). Unlike many of the behaviorists and even cognitive psychologists before them, cognitive neurologists are re-defining learning as a growth in "neural connections" and "networks" affected by the environment as well as conscious and unconscious processes (Hardiman, 2001; Fishback, 1998/1999). They are also careful to qualify the neurological basis of learning by pointing out that although learning is a process of creating neural connections, just the simple creation of connections does not mean learning has taken place. There are many more processes, including conscious ones, that must occur for conscious meaning and understanding to develop. To gain a more precise understanding of these connections and the process that both inform and result from them, it is important to review essential characteristics of the brain that current research has uncovered.

Survival/desire-based

The brain is not designed for instruction (Reardon, 1998/1999)! Startling, but true. This, of course, does not mean the brain is not designed for learning; in fact, that is its primary function. However, what necessitates that learning is often misunderstood: The brain learns so that it can survive; it is constantly engaged in a process of meaning-making because by making sense of its environment, the brain can adapt to it and survive (Caine & Caine, 1990). This process is accomplished through inquiry and experimentation until the brain adapts to its environment and, thus, survives (Reardon, 1998/1999). Since survival is innate, it is also based in desire (Illeris, 2002); that is, the brain essentially learns what it wants to learn.

Plasticity (neuroflexibility)

The characteristic that the brain has to actually change its physical structure as it responds to experiences is called *plasticity* (D'Arcangelo, 1998). As the brain makes connections in response to stimuli, it actually grows new physical structures (dendrites) in order to make these connections. It also strengthens these connections and neural pathways with experience and practice. Pathways that are reinforced in these ways become more complex (Bower, 1999); those that are not reinforced not only fall into disuse but are physically pruned to allow room for other connections. Plasticity does not suggest that the brain molds itself to fit a specific situation; rather, plasticity is an observable representation of how the brain reorganizes itself as it responds to its environment (Rose, 1998/1999; Jensen, 2000). The most active forms of this reorganization occur in the cerebral cortex where higher cognitive functions such as memory and learning occur (Hill, 2001). Although general plasticity can be increased by repetition of certain cognitive processes (e.g. questioning, critical thinking, analysis, vocabulary acquisition), there are some processes, such as language, that lose their flexibility over time (Fishback, 1998/1999; Rose 1998/1999).

Connectedness

The brain experiences the world as sets of interconnected stimuli (D'Arcangelo, 1998; Howell, 2001). This characteristic derives from its physical structure and processes which result in actual physical connections between dendrites. These connections occur when the brain associates stimuli with past experience. These associations result in networks of related information that begin to resemble almost a forest of thick neuronal connections (Keivipermann & Gage, 2002; Fishback, 1998/1999). The use and density of these networks as pathways of thought are reinforced by continued use—repetition of those pathways (also called *canalization*)

(Fishback, 1998/1999; Gardner, 1993). One result of this connectedness is that the brain naturally and simultaneously perceives parts *and* wholes. In doing this, all regions of the brain tend to work together, even though certain areas encompass more localized activities. For example, spatial processing, which involves applying small pieces of information to larger, spatial relationships, happens from left to right across the brain. The brain processes time from back (past) to front (future) (Reardon, 1998/1999). The entire brain is interconnected in almost all of its processes, and that is the way it makes sense of the world.

Patterning

As the brain connects new information with existing information, not only does its physical structure change, so does the nature of its processing. Not only does the brain create connections, but on other levels it also searches for patterns in those connections. The brain then uses these patterns to create meaning and ensure its survival (Abbott & Ryan, 1999; Caine & Caine, 1990). The search for and creation of meaning, then, is innate—our brains automatically detect patterns and create meaning. The more connections it makes, the more associations it creates; the more associations, the more the information and its meaning become "woven" into the fabric of the brain (Reardon, 1998/1999).

Selective

The process of association and meaning-making begins with information capturing. Although the brain can attend to much more stimuli than we are conscious of, it is still selective as to what information it takes in and actually *uses* to create associations. Research from the Salk Institute suggests that the brain incorporates a dual strategy of information acquisition and association creation. Simultaneously, the brain "captures general information" from its environment *while* it is also searching through "earlier experiences for meaning" (Abbott &

Ryan, 1999). If it cannot locate an earlier experience to create an association with, it will store the experience in short-term memory. How long the experience stays there before it is eliminated or is transferred to long-term memory is a product of the individual's interests, conscious desires, and how the individual consciously manipulates the information (e.g., does the individual develop a conscious realization this information might be useful later and either write it down, discuss it, or analyze it) (Illeris, 2002).

Parallel Processing

Because learning is a result of creating networks of neural connections and, thus, new neural pathways, the brain is always searching for new connections. It does this by searching millions of previous experiences and connections—in different domains—simultaneously (Hill, 2001). In other words, in its search to create meaning, the brain will access thoughts, emotions, perceptions, imagination, and experiences in practically the same moment (Caine & Caine, 1990). This multi-path, multi-domain processing has the illusion of being linear but only because we cannot consciously separate the discreet, simultaneous processing that is occurring (Reardon, 1998/1999). Rather than linear, meaning-making can be visualized as more of a web-like process with conscious decision-making affecting the extent and the shape of that web.

Contextual

In its processing of information to create connections, associations, and, eventually, meaning, the brain sorts information according to whether it is connected to content or context. Information that is related to content is essentially anti-meaning in nature. In other words, it remains as simply an unassociated piece of information because the brain can find no connection with existing information. This information is usually information that the brain is asked simply to memorize without association; it is also information that the brain tends to select and eliminate

if an association is not made over time. When this information is given a context that resembles the experiential environment, it then fits into the brain's natural structure of connection and association. This process of contextualizing or "embedding" is what makes a learning event authentic and, therefore, almost effortless. If the content can be embedded in a life situation, the brain will not only process the information in multiple domains (emotionally, cognitively, spatially), but because the content is embedded in a context already familiar to the individual, the brain will automatically associate it to what is familiar, resulting in both storage as memory, and, more importantly, storage as meaning (Hill, 2001; Hardiman, 2001; Caine & Caine, 1990).

Social/Collaborative

The very nature of association and connection is collaborative. Just as neural connections are simply a way of creating context to associate information, the acts of connection and association are, in themselves, collaborative. The brain creates meaning by "collaborating" incoming information with existing information. The result of collaboration is the creation of networks and, ultimately, meaning. Because this is a natural characteristic of the brain, creating collaborative situations, like embedding information in authentic contexts, simply allows the brain to create meaning more efficiently. Although it is obvious that thinking occurs on an individual basis, creating an enriched environment where individuals are exposed to alternative experiences as well as multiple perspectives only increases the probability of association creation (D'Arcangelo, 1998; Wolfe & Brandt, 1998). The more enriched (stimulating and diverse) the environment, the more flexibility is created as the brain adapts to its environment (Abbott & Ryan, 1999). The more interaction, the more chances the brain has to experience patterns in its environment. Social interaction also increases hormone levels that stimulate the production of certain neurotransmitters that aid in neural-connection (Jensen, 2000). It has also been suggested

that higher cognitive functions (such as language) are based in social processes (Wambach & Brothen, 2000).

Consciousness

Consciousness is defined in many fields including philosophy, psychology, and sociology. How the brain creates consciousness is still unclear. Of the several views of consciousness to come out of brain research, two have the most promise of application to adult learning. One view suggests there are two forms of consciousness. One form of consciousness is based in sensate data (information that is captured by the senses) and the other is based in the meaning that is constructed from this data (Hill, 2001). In other words, one level of consciousness focuses on what an individual experiences; another level involves the awareness of the meaning that results from the experience. Another view of consciousness also incorporates a bi-level structure. One level, the "core consciousness," encompasses the states of "wakefulness, background emotion, and low-level attention." The second level, extended consciousness, synthesizes experiences with the elements of core consciousness resulting in the creation of an individual history, a sense of self. Proponents of this view argue that the development of a "self" is an essential component to the development of intelligence and even though it is an innate capacity, it can be profoundly influenced by culture (Hill, 2001). Regardless of the particular view, consciousness plays a significant role in the brain's meaning-making processes. Most of the information we receive from our environment is captured by the brain and is processed unconsciously. If it does reach consciousness, it is delayed, often only after it has influenced perceptions, motives, and decisions (Caine & Caine, 1990). The development of consciousness, often through metacognition (thinking about how we think) and

simple reflection, is an effective way of affecting the creation of meaning and increasing the possibility of adaptation.

Memory

The development of consciousness, as the ability to create non-immediate associations, is inextricably tied to memory; our ability to hold information in our long-term memory is directly related to our brain's ability to create meaning. When we first experience sensations, we temporarily store them in short-term memory until the brain decides whether to transfer them to long-term memory (Fishback, 1998/1999; Hardiman, 2003). When the brain retrieves information from long-term memory in order to be consciously manipulated, it pulls the information into an "active" area of long-term memory called "working memory" (Woltz, 2003). This is a large portion of long-term memory that works as a sort of staging area where conscious learning and meaning-making take place. There are several conditions and behaviors that increase the possibility that information will be stored in long-term memory and can be retrieved into working memory:

1) complex cognition (e.g., analyzing a word instead of just memorizing it)
2) connection to personal experience
3) focus and concentration
4) elaboration—attaching sensory information to a piece of information (sight, sound, smell, etc.)
5) repetition
6) engaging emotions (strong emotions = strong memories); however, if the emotions are too strong, the brain could shut itself down into a lower functioning survival state. (Fishback, 1998/1999; Caine & Caine, 1990; Taylor, 2001)

Once memories are stored, they are not stored intact. The brain stores different types of information in different areas. For example, when you store the memory of a movie, your brain stores the dialogue in one area, the visuals in another, and the music and sound in yet another area. When it is time to recall the memory, the brain actually searches several areas simultaneously to create a whole memory (another example of parallel processing) (Fishback, 1998/1999).

One element of long term memory that has become clearer is how *implicit* memory (nondeclarative memory or non-conscious cognitive processing) functions to create habits, attitudes, and preferences. Implicit memory is significant in that it involves abilities that are created and improved upon outside of our awareness. Procedural skills and habits are one type of ability processed in implicit memory. Individuals often learn even complex procedural tasks (like solving math problems or puzzles) without consciously memorizing the procedure. The ability to classify into general natural categories (e.g., plants, animals) is another skill developed in implicit memory. This ability to classify can also be applied to grammar rules. Many individuals have acquired abstract rules of grammar and can apply them successfully even though they cannot recall ever having consciously learned them (Taylor, 2001; Hill, 2001; Woltz, 2003). Current research into multiple intelligences suggests abilities that closely resemble those found in implicit memory.

Focus

Focus and concentration (attention) are keys to the brain's ability to store, access, and associate information. However, it is important to understand that the ability to stay focused is affected by fluctuations in brain chemistry; the brain actually functions normally when it fluctuates from periods of "high" attention (focus) to periods of "low" attention (non-focus)

(Reardon, 1998/1999; D'Arcangelo, 1998). Although these periods of fluctuation vary individually, their existence is constant. In addition, new synaptic connections need time to strengthen, which is one reason researchers believe these fluctuations occur. (D'Arcangelo, 1998). Not only is learning affected by direct, focused attention, it is also affected by "peripheral" attention (Caine & Caine, 1990). This is attention to peripheral stimuli that is most likely unconscious but can have a significant effect on emotions, memory, and learning in general. Some examples of peripheral stimuli include wall color, sound, room temperature, voice tone, and movement. When the brain captures information, it generally captures the entire sensory environment at the same time (Caine & Caine, 1990).

Emotions

Although cognitive and educational psychologists have argued for years that emotions (affective domain) have a significant effect on learning, teachers have often tended to overlook this connection—not without good reason. We often find feelings suspect; they appear to be illogical, and when we *do* engage students' feelings, we often find our activities derailed by non-critical passion, inattention, and the desperate feeling of our own that we have lost control. More often than not, we have an implicit belief that reason and logic are only authentic if they are devoid of emotional passion (Taylor, 2001). This apprehension of dealing with emotions in the classroom is substantiated by a variety of contemporary learning theories. An example of one such theory is Jack Mezirow's Transformative Learning Theory in which he posits that authentic learning is only a result of critical thinking and reasoning. Critical thinking and reasoning is a direct result of organized and earnest self-reflection (metacognition). In fact, for Mezirow and other theorists who emphasize self-reflection and self-regulation, emotions play no part in that reflection (or should be controlled so that they do not influence the reflection); the reflection

becomes contaminated (and, therefore, non-authentic) if emotions are considered (Mezirow, 1991).

This conviction that genuine reason is devoid of emotion actually has an established history in Western thought and philosophy. It is based in the almost unchallenged belief that the mind and body (brain) are actually separate entities, and, therefore, the activities that occur in those two domains are also discretely separate. Although the idea has existed in many forms for millennia, it has been most succinctly crystallized in one of the most famous phrases in Western philosophy: Descartes' *cogito ergo sum*—"I think therefore I am." In this one phrase, Descartes summarized not only the basis for a new philosophy of being and knowledge but of a view of the body and mind that would pervade Western medicine, psychology, and even education more than 350 years later. With this statement, Descartes suggests that thinking and our knowledge of our thinking are the true measures of our being, our existence. He also argues that this thinking has "no need of a place, nor does it depend on any material thing; [. . .] the soul by which I am what I am, is entirely distinct from the body" (Damasio, 1994, p. 249). This complete separation of the mind from the body (the virtual uselessness of the body in relation to the processes we use to define "self") also includes the understanding that the processes of the mind, including reasoning and critical thinking, are completely divorced from our somatic ("soma" is Greek for *body*) responses including feelings and intuition.

This idea has become so entrenched in our cultural psyche that almost any student we talk to would be inclined to include "unemotional" or "lack of emotion" as characteristics in her definition of reason or critical thinking. This dualism of body and mind (the "disembodied" mind) (Damasio, 1994, pp. 250-251) is one of the assumptions that the behaviorists operated under and also seems to color much of what we do in the classroom as we continue to create

objectives, goals, activities, and tests that equate knowledge acquisition and retrieval as "learning" and "critical thinking" and "reasoning" as the products of pure, un*affected* thought. However, cognitive psychologists have been telling us for years that emotions are one of the many significant cognitive processes used in the creation of meaning; and now, current research on real-time brain functions has not only substantiated the role of emotions in thinking and learning but revealed a complex network of high order thought processes (e.g., reasoning and critical thinking) that are directly and profoundly affected by emotions.

Using PET (positive emission tomography), researchers are able to view blood flow in the brain during certain activities, including cognitively demanding tasks. What they have discovered is that in tasks involving high order cognitive processes, blood flow not only increases in the cerebral cortex (the seat of reasoning and high order critical thinking) but also in the amygdala (the seat of emotional processing). In further studies, researchers have discovered that not only is there a relationship between reasoning and emotions but intense emotional experiences often serve as "guideposts" for reasoning, serving as filters in the creation of meaningful patterns (Taylor, 2001). There is a substantial amount of brain research to suggest that critical thinking and emotions are inextricably connected in the process of reason and meaning-making and more attention should be paid to this connection.

Because the brain learns by creating physical connections between many different areas, brain researchers argue that learning is "state dependent"—learning involves the interdependent influence of thoughts, feelings, and physiology; if one state is affected, they are all affected (Reardon, 1998/1999). This interdependency is the basis for the argument that we cannot create meaning, we cannot learn, until we learn how to express it affectively (emotionally) (Taylor, 2001). In addition, emotions are seen as one of the most significant influences on the brain's

primary functional goal—survival (Hill, 2001). Some researchers argue that when we react to stimuli, as the brain is searching for connections, we experience feelings as the top layer of that reaction. We are conscious of these feelings but we might not be conscious of the deeper emotions that have triggered them.

Although learning theory tends to use "feelings" and "emotions" interchangeably, there is a suggestion that *feelings* are not cognitive events that occur in our explicit (conscious) memory but are simply a conscious version of *emotions* which are a fundamental *state* residing in our implicit (long-term) memory that we cannot control. From this perspective, feelings become "another way of knowing" (Taylor, 2001). If this is true, then, as Joseph LeDoux (1996) says, we "'cannot separate thought and emotion'" (Fishback, 1998/1999); therefore, emotions and their resulting feelings are "inherently cognitive" (Taylor, 2001). Since reasoning and higher order critical thinking skills begin with the physical process of "knowing," then it is not unreasonable to argue that emotions play a role in the development of these higher order cognitive processes. The development of reason is one of many results of the brain's meaning-making process. That means it is also the result of a process that involves "multiple systems." Emotions belong to one of those systems. In fact, emotions interact so intimately with other cognitive systems that they are a source for both physical movement, thought, and reason (Taylor, 2001).

So, if emotions are part of the meaning-making process, how significant is their influence? Neurobiologists argue that emotions are generally a response to physical changes in reaction to stimuli. These physical changes cause the release of certain chemicals in the body like adrenalin. Emotions are one way the brain interprets these physical changes (Rose, 1998/1999). However, since emotions occur in implicit memory and are the state the brain

reverts to in times of extreme stress, it is also argued that emotions play a more profound role in the creation of meaning and reason than just the associative role they were once believed to play (Fishback, 1998/1999; Reardon, 1998/1999). Brain research not only agrees with cognitive psychology that emotions play a role in meaning creation but argues that emotions are actually the basis for reasoning and learning (Taylor, 2001, Hill, 2001). Emotions (including what we often call intuitions and attitudes) are believed to serve as filters that both encourage and limit learning and the creation of meaning, often "filling the gaps left by pure reason" (Hardiman, 2001; Caine & Caine, 1990).

Because of their clear connection to the limbic (basic survival) portion of the brain, emotions often drive the brain's learning by selecting what is important to pay attention to (D'Arcangelo, 1998; Wolfe & Brandt, 1998). Fear and physical attraction (both of which many behaviorists and social psychologists would argue are learned) have remained strong drives that create chemical changes resulting in changes in blood flow, focus, and even physical movement (e.g., fleeing a predator). If emotions are so fundamental to how the brain behaves, how can they be separated from even conscious functions like reason? Because of the fundamental influence emotions have on brain activity, neurobiology is even now suggesting that emotions are the "guideposts" to critical reflection, the "rudder for reason" (Taylor, 2001, p. 234). Some cognitive neurobiologists are even beginning to conclude that all thinking, including thinking that involves creativity and logic, is actually emotionally based (Reardon, 1998/1999).

Because of the interdependency of thought, feeling, and physiology in the brain's processes of meaning-making, anything that affects our physiology affects our learning (Caine & Caine, 1990). This includes even the most obvious influences on our physiology like nutrition and sleep. However, stress has one of the most significant effects on how we learn. It has

certainly been argued that certain types of stress at certain levels are beneficial—assignment deadlines can create stress that leads to motivation (albeit extrinsic and transient); stress caused by fear can keep us from committing crimes or even hurting ourselves. All stress causes the release of adrenaline into our systems; the amount of adrenaline released (and, therefore, the extremity of the physical and emotional reaction) is the direct result of the level of danger that is perceived. Perceived danger is translated by the limbic region of the brain into fear that triggers a release of adrenalin in order to create a physical response that allows us to protect ourselves—to survive. With the release of adrenaline, the brain "downshifts" into a more basic mode of operation in order to find a stasis from which it can concentrate its energy on the immediate threat (Reardon, 1998/1999; Caine & Caine, 1990; Fishback, 1998/1999). This is less a short-circuiting of the brain's ability to create higher ordered thinking than it is a shifting to a more focused mode of processing. In this state, the hippocampus actually shrinks, severely limiting the brain's ability to make connections and store them. Although not all stress is unproductive, high levels of and prolonged exposure to stress severely restrict learning, especially high ordered processes such as reasoning and critical thinking.

The brain is a dynamic, growing, adaptable learning organism. It responds to stimuli in its environment and makes physical connections within its neural structure in order to create meaning for essentially one purpose—survival. The processes involved in this activity are as simultaneously interdependent as they are complex and include the processing of emotion, past experience, characteristics of the immediate environment, interaction with others, and the context that the experience is embedded in. As the brain creates connections between these processes and states, it searches for patterns that it can use to create meaning. These processes are significantly affected by physiological changes resulting from stress, nutrition, and the physical characteristics

of the environment. Because the brain's ability to make meaning is based on its continuous ability to grow dendrites and make connections between them, the brain's capacity for continued growth is immeasurable. Because these connections, and the subsequent growth, are largely based on connections the brain makes with past experience, the way the brain grows and learns is unique to each individual (Rose 1998/1999; Caine & Caine, 1990; Wolfe & Brandt, 1998). Because the brain is so adaptable and continues to grow and make connections even as it ages, adults can continue to learn without significant difficulty if the learning experience is authentic (Hill, 2001).

As much as we would like to rush to apply what we are learning about how the brain learns to the classroom, we must be careful. First, application of the direct results of research need to be filtered through theory related to the particular application—in this case, educational theory—before it can be applied. We cannot say that "Brain research proves this or that" because it actually does *not* prove anything about instructional practice (Jensen, 2000). This is primarily a result of the fact that the relationship between the neurological processes of learning and intelligence (the abilities that instructional practices focus on developing in out students) is not always productive. In other words, the creation of synapses does not mean greater intelligence; it simply means the creation of more connections and the possibility of creating more complex networks of knowledge (Jensen, 2000). What the student experiences during the educational process builds on these connections and is the more significant determiner of intelligence. Finally, even with all the research that has been completed in the last fifteen years, we are only really beginning to scratch the surface of how the adult brain works (Miller, 2003; Caine & Caine, 1990). If there is one thing the research has taught us, it is that there is still an overwhelming number of confusing variables at work to conclude much that is concrete about

how adults learn (Rose, 1998/1999). Many researchers agree that there is still a significant "disconnect between the established field of cognitive sciences and neuroscience" (Taylor, 2001, p. 234). They urge adult educators and educational psychologists to begin doing more direct research on how the physical processes of the brain relate to how adults learn in the classroom (Rose, 1998/1999). Educational psychology needs to begin creating educational theory that is consistent with "relevant research in cognitive neuroscience" (Mayer, 1998, p. 389). Finally, as adult educators, we need to be extremely careful about simply applying research conclusions without tested theory to support it. Some of this, surprisingly, can be done on a very small scale within our own classrooms. But wherever and however we apply this information, we need to realize that cognitive neuroscience is only "one source for research; it's an important part of a larger puzzle" (Jensen, 2000, p. 77).

Non-Intellective Intelligences

Esteem of knowledge and the intelligence that arises from it is foundational to human existence. Most of what a society would define as "civilized" is a result of defining values and then measuring to what extent those values are both present in the society and to what extent those values influence the society. Certainly, knowledge, intelligence, and wisdom are highly valued in all societies, although their substance and practice take many forms. Since the Classical period of ancient Greece, Western culture has tended to take two general views of the mind. First, the development of the mind (and, therefore, the development of intelligence, intellect, logic, and reason) involves a "singular, inviolable capacity" that we are born with. In other words, our intellectual capacity is not only innate; it can be measured by measuring the single capacity of intellect (Gardner, 1993). This is the basis on which I.Q. tests have been formulated and utilized—with the understanding that they not only accurately measure an

individual's intellectual ability but that this measure has predictive force in determining an individual's success or failure in social, education, or vocational contexts. In relation to neurobiology and theories of knowing and consciousness, a researcher holding to this view (a holist) would argue that significant intellectual functions are a property of the brain as a whole—that although the brain might process different types of information in different areas, it is in the neural-connecting of these areas into a whole that results in consciousness, meaning, logic, and reason (Gardner, 1993).

A second view argues that the mind is actually the sum of many discrete parts that act independently. In this view, logic, reason, intellect, will, and feeling are discrete processes. This is, in substance, what Descartes argued when he stated "cogito ergo sum"—that the ability to *know* (and, by implication, to be both conscious and intelligent) is a direct result of the capacity to think and to think about thinking, which is separate from less important capacities such as the ability to feel. For the brain researcher holding this view (defined by Gardner [1993] as "localizers"), different areas of the nervous system arbitrate various intellectual abilities.

In the 18th century, these two views were still very much alive and exerting powerful influence over the development of theories of thinking, knowing, consciousness, and meaning. Many psychologists believed the mind was divided into three parts: cognition (thought), affect (emotion), motivation (Salovey & Mayer, 1997). As subsequent researchers began to look at these three areas, they began to develop the idea that each of these areas actually worked together to create measured intelligence. With the rise of cognitive psychology in the mid 1900s, learning theories involving cognition abounded. But at the same time, other theorists and researchers were beginning to look at other forms of intelligence. Although not commonly known, work on non-cognitive (non-intellective) intelligences has been occurring for the better

part of the 20th century (Salovey & Mayer, 1997). This research has focused predominantly on children and has largely been a reaction to a traditional educational system that leaves profound gaps in children's knowledge bases. It views the educational system as a system that emphasizes linguistic and logical-mathematical intelligence and tends to incorporate a limited number of learning strategies to develop these intelligences, most notably lecture and rote memorization (Diaz-Lefebvre, Siefer, & Pollack, 1998). Our philosophical heritage of considering the intellect and intelligence as comprising several capacities rather than just one intellectual quotient, in conjunction with a growing dissatisfaction among educators and educational psychologists with the quality of learning that occurs within many Western education systems, have fueled a recent concentration on the area of multi-capacity, multi-ability intelligence theories and the models they inform.

The seminal work on non-cognitive intelligences is, arguably, Howard Gardner's 1983 book *Frames of Mind.* In this book, and subsequent research, Gardner argues that intelligence is actually not the possession of one particular set of skills or abilities but the possession of a high level of competence within a specific domain. To define an individual as intelligent, then, by assessing their abilities in one or two domains is not only inaccurate by could prove to be disastrous, especially if that assessment will be used as the basis of educational or occupational placement. Gardner theorizes that all of us are born with at least eight intelligences that have evolved to assist the brain in its problem-solving functions that lead to its overall goal of adaptation and survival. He also argues that even though we are born with these intelligences, they are not fixed at birth, and intelligence is dynamic, changing over the course of our lives (Gardner, 1993). Although we are all born with these intelligences, our backgrounds, environments, and choices result in some intelligences becoming more dominant than others. It

is important to note that although Gardner claims these intelligences "exist on the basis of their cultural significance and their corresponding brain structures" (Salovey & Mayer, 1997; Taylor, 2001), his research focuses on sources that are often viewed as unrelated: "studies of prodigies, gifted individuals, brain-damaged patients, *idiots savants*, normal children, normal adults, experts in different lines of work, and individuals from diverse cultures" (Gardner, 1993, p. 9). Even though he is careful to include recent discoveries in neurobiology as they relate to the situating of knowledge processing and meaning-making in the brain, but his theory is *not* based on neurobiological data.

It is also interesting to note that Gardner has a clear idea of how he wants his theory of multiple intelligences (M.I.) to affect current debate on the human intellect. He hopes to:

1) expand the "purview" of cognition and intelligence to include thorough explorations into the biological and cultural roots of intelligence
2) examine more thoroughly the educational implications of multiple intelligences
3) inspire "educationally oriented anthropologists" to develop models that will provide insight into and explanations of cultural influences on intellectual capacities
4) influence educational practitioners (and not just those in academic settings) to develop approaches that more fully embrace an individuals diversity of intelligence rather than focusing on one aspect of that intelligence in order to more fully support the individual in the development of her potential (Gardner, 1993, pp. 9-10)

The determination of whether an ability is actually an intelligence, as opposed to a less complex and pervasive predilection toward a specific kind of behavior, is the result of applying a series of criteria (what Gardner calls "signs"). The more of these signs that are applicable to a particular ability, the more likely it is to be considered an intelligence:

1) The ability can be destroyed or spared as a result of injury to a specific part of the brain (the creation of a *lesion*—a disruption of normal functioning). The issue here is the autonomy or relative independency of the ability. If the ability cannot be isolated from other abilities, then it does not function as a pure intelligence.
2) The ability exists in savants, prodigies, and exceptional individuals. This allows the observation of one or two exceptional abilities that co-exist with more attenuated or mediocre abilities in other domains. The independency of these exceptional abilities can be more clearly articulated because of their possible genetic causes and their ability to be linked to distinct neural regions in the brain, thus enhancing the notion of independency.
3) The ability contains a core operation or set of operations that can be identified as occurring in a distinct region of the brain, within a specific "neural substrate."
4) The ability should have an "identifiable developmental history" through which normal and even gifted individuals pass through. It should be able to be divided into levels of expertise that would include lower levels of competency up through and including exceedingly high levels of competency. In other words, this ability can exist at many different levels across a diverse population.
5) The ability becomes more plausible as an intelligence if its evolutionary roots can be located and indentified
6) The autonomy of the ability and the demonstration of its significant influence on complex tasks are supported by experimental psychological tasks
7) The autonomy of the ability and the demonstration of its significant influence on complex tasks are also supported by credible and effective psychometric testing:

results from tasks that are designed to test one type of intelligence should correlate highly with results from different tasks that are designed to measure the same intelligence. Conversely, the results from tasks that are designed to measure one type of intelligence should *not* correlate highly with other tests designed to test other types of intelligence.

8) The ability should lend itself to be used within a symbolic system (e.g., language, pictures, mathematics) that is *not* culturally specific. (Gardner, 1993, pp. 63-6)

For Gardner, each intelligence is actually a behavioral ability (an ability to perform) based on a set of implicit knowledge about a specific domain (Casazza, 1998):

1) *Verbal-linguistic* intelligence allows us to communicate highly complex ideas relatively quickly compared to mother forms of communication
2) *Logical-mathematical* intelligence allows us to analyze and engage in higher-order thinking
3) *Musical-rhythmic* intelligence allows us to use the rhythms and patterns of music to sharpen our focus of thought and deepen our insight
4) *Visual-spatial* intelligence allows us to express our knowledge of the world through graphic images like pictures, diagrams, or maps
5) *Bodily-kinesthetic* intelligence allows us to develop understanding when our bodies are active, developing a physical connection with a concept or idea
6) *Interpersonal* intelligence allows us to develop an understanding of the world through our interaction with and understanding of others
7) *Intrapersonal* intelligence allows us to make sense of our lives through reflection and introspection (Brougher, 1997; Taylor, 2001; Gardner, 1993)

Gardner (1999) later added an eighth intelligence:

8) *Naturalist* intelligence allows us to create meaning based on our relationship to our natural surroundings, specifically animals and plants.

In his suggestions for how multiple intelligences can be considered in educational practice, Gardner is very clear that the goals of the practice must first be outlined before a consideration of the intelligences can take place. He insists that instructional precision should be the guideline when developing these goals; it is much more productive, for example, to set a goal of "'achieving sufficient literacy to read a newspaper or discuss a current political problem'" than it is to set a goal of "'educating individuals to achieve their potential'" (Gardner, 1993, p. 383). Once a goal is articulated, it should be reviewed for its appropriateness and then assessed in relation to what means are currently available to meet the goal. In this part of the process, it is appropriate to begin considering which intelligences should be "mobilized" to achieve these goals, which can also include a blend of intelligences (Gardner, 1993, p. 384).

In assessing these intelligences, Gardner warns not to assess the same intelligence in the same way at different ages. Because intelligences are often culturally determined and influenced *and* the brain continues to change as it develops, the expectation that intelligences will look the same from one year to the next or even one individual to the next is counter-productive. Finally, Gardner suggests that considering intelligences in an educational setting does not mean that the intelligence are focused on at the expense of the more generalized goal of instruction. It simply means that teachers should be trained to recognize the multi-faceted nature of intelligence, that, as a result, there is more than one way to assess intelligence, and that facilitating the development of students' ability to identify and use their intellectual capacities is a productive educational goal.

The theory of multiple intelligences has opened a floodgate of new thinking about how we learn, how we know, what intelligence is, and how we should measure it. One of the more specific theories of intelligence to result from the suggestion that intelligence comprises distinct, interrelated abilities, is Daniel Goleman's theory of emotional intelligence (EQ). Although Goleman's theory is arguably an extension of Gardner's, we can also see its roots in early cognitive psychology when a significant view of research into non-cognitive intelligences tended to group these intelligences into three groups:

1) verbal-propositional—measures of vocabulary, language fluency, and logical thought
2) spatial performance—assembling objects and recognizing patterns
3) social—ability in personal relationships (Diaz-Lefebvre, Siefer, & Pollack, 1998)

Social intelligence was, and still is in many ways, problematic. In order to be recognized as a discreet intelligence, it must not highly correlate with other intelligences or cognitive activities. When intelligences are highly correlated, their measurable functions are similar and might even duplicate each other. In this regard, social intelligence has generally been highly correlated with the other two intelligences (verbal-propositional and spatial performance), essentially indistinguishable from them. In other words, people who tend to be successful in social contexts also possess highly effective verbal-propositional and spatial skills. Although social intelligence is now being redefined in a way to make it more distinct, other researchers are investigating emotional intelligence as the third group of intelligences rather than social intelligence (Salovey and Mayer, 1997).

Emotional intelligence, as argued by theorists like Goleman and Guilford, can be defined as the "ability to perceive emotions, to access and generate emotions so as to facilitate thought, to understand emotions and emotional meanings, and to reflectively regulate emotions so as to

promote better emotional and intellectual" (Salovey and Mayer, 1997, pp. 10 & 22; Goleman, 1995). The result of the use of these abilities is often referred to as "emotional character." Two models of emotional intelligence have developed as learning theorists and educators struggle with how the knowledge of emotional character can affect classroom instruction. One model, called the "ability model" (emotional intelligence model), suggests that emotional character influences thought and the development of reason. A second model, the "mixed model" (emotional learning model) tends to mix emotional abilities with social traits and behaviors. This second model has been more highly popularized because of its ability to be readily applied to instruction (Cobb & Mayer, 2000).

However, because this mix of traits, skills, and behaviors is difficult to measure, some researchers have expressed concern that, perhaps, popularized models like this one have run too far ahead of the science on they are based on. That is why these same researchers argue that the ability model, because of its limited focus, is probably a better model (Cobb & Mayer, 2000). Rather than a collection of vague feelings or traits (Salovey & Mayer, 1977), proponents of emotional intelligence argue that it is actually a network of discreet abilities organized into four broader groups, with the discreet abilities becoming either present or more sophisticated with age:

1) Reflective regulation of emotions to promote emotional and intellectual growth includes the ability to
    a. stay open to both negative and positive feelings
    b. engage or disconnect from emotions depending on its perceived utility within a certain context

c. monitor emotions both within and in relation to others based on how clear, influential, or reasonable they are

d. ability to manage emotions by moderating negative ones and enhancing positive ones without modifying the meanings they convey

2) Understanding and analyzing emotions and employing emotional knowledge includes the ability to

a. label emotions accurately and understand the relationships between different emotions and different degrees of emotion

b. interpret the meanings that emotions convey regarding relationships, such as that sadness often accompanies loss

c. understand complex, often simultaneously contradictory feelings (like love and hate or fear and surprise)

d. recognize transitions among emotions, such as the transition from anger to satisfaction, or from anger to shame

3) Emotional facilitation of thinking includes the ability to

a. recognize that emotions prioritize thinking by directing attention to important information

b. understand that emotions can be generated and be used as aids to judgment and memory concerning feelings

c. recognize that emotional mood swings change an individual's perspective from optimistic to pessimistic, encouraging consideration of multiple points of view

d. understand that emotional states encourage specific problem approaches such as when happiness facilitates inductive reasoning and creativity

4) Perception, appraisal, and expression of emotion includes the ability to

a. identify emotion in one's physical states and thoughts

b. identify emotions in others, art, texts, etc., through language, sound, appearance, and behavior

c. express emotions and the needs related to those emotions accurately

d. distinguish between accurate and inaccurate or honest and dishonest feelings (Salovey & Mayer 1997)

e. delay gratification (Goleman, 1995; Liff, 2003)

This entire discussion of emotional intelligence might be interesting, but its application to learning would be spurious if cognitive psychologists and neuroscientists didn't substantiate that emotions play a profound role not only in the acquisition and processing of knowledge but also in higher cognitive processes such as critical thinking and reasoning. Contrary to the perspective of many instructors that emotions, especially intense ones, only "hijack" the learning process and interrupt both the flow and product of learning, these same researchers also suggest that this interruption might actually promote intelligence by disrupting current cognitive processes and pointing the brain toward what might be more important. This "prioritization of cognition" is one of the many elements of critical thought. It also involves a process of self-awareness (an awareness of how we feel in specific contexts) and self monitoring (the ability to use emotions to set goals and monitor our progress in relation to the goals) that allows us to react to and make meaning from our environment (something that the brain tends to do automatically) (Liff, 2003).

It is also important to keep in mind that most of the work on emotional intelligence is still theoretical and is just now beginning to drive other research into both cognitive psychology and cognitive neuroscience. Although there are few studies that have actually measured the existence or non-existence of emotional intelligence, these studies do agree that many of the abilities listed above "inter-correlate with one another and are partly independent of general intelligence" (Salovey & Mayer, 1997, pg 17). Many researchers and theorists agree that general intelligence accounts for only between 10% and 20% of academic and occupational success (a very few propose it can be as much as 50% [Liff, 2003]). This leaves approximately "80% to 90% [of this success] to be explained by other factors" (Salovey & Mayer, 1997, p. 17). If the independence of emotional intelligence from general intelligence is true, as some of the research suggests, then emotional intelligence will eventually be regarded as a separate intelligence and one of those "other factors" that influence success.

It is strongly argued by proponents of emotional intelligence that the teaching and exercising of these abilities has a profound effect on not only how students construct their knowledge of the world but how students learn cultural and personal values and other desirable social skills such as conflict resolution and tolerance (Salovey & Mayer, 1997, pp. 19-20). Because "the integration of these skills is significant in shaping the quality of one's life experience[,] the college experience should be no exception" (Liff, 2003, p. 28). However, if this is true, and "higher order thinking can be enhanced through empathic teaching," there are still no clear guidelines for how this teaching should take place (Cobb &Mayer, 2000). Others also suggest that the way individuals approach emotions is often culturally and belief-specific (i.e., different religions interpret emotions and their effects differently). Whatever else this means, it certainly suggests that emotional intelligence, regardless of whatever value it might

have in relation to knowledge acquisition and meaning-making, is problematic to address in the classroom.

In addition, although theories of emotional intelligence generally substantiate research conclusions in other fields about the influence of emotions on learning, the lack of a formal learning theory based in emotional intelligence suggests that we should be careful about simply interpreting instructional strategies from this theory. Rather, we should use the idea of emotional intelligence and the abilities it comprises in conjunction with more formal and substantiated theories of adult learning to inform our pedagogical practices—remembering that until the practices themselves are studied and their effectiveness measured and evaluated, they remain simply good ideas.

Generally, the study of non-intellective intelligences reminds us of what cognitive psychology has been telling us for years and what the more recent neurocognitive research is suggesting about learning and the brain: There are many determinants of learning and resulting intelligence, and to focus on one element as the most significant is anti-theoretical, anti-learning. Just as it is widely accepted that IQ is not the sole determinant of intelligence, neither should cognitive development be likewise considered. In fact, it is spurious at best to even suggest that a student's response in a particular context can even be generalized to a perceived level of cognitive development (Kirby & Biggs, 1980). Therefore, what we define as learning and intelligence needs to remain inclusive, with the understanding that "intelligence" is often task and especially context specific.

In an attempt to translate these notions of non-cognitive intelligences into an instructional framework, educational psychologists and theorists have developed different ways to assess intelligences and their relationship to learning by evaluating a student's learning style (or

preference)—how a student learns based on their intelligences (their abilities in a specific domain). This notion of learning style has become increasingly significant not just in formal educational settings but in the workplace as well. Not only are we developing a greater awareness of how culture and personal experiences influence the learning process, we are also developing a greater ability to assess that influence and create learning events that maximize it. As our classrooms become increasingly more intellectually, culturally, and socially diverse, and as we continue to struggle with creating effective learning environments for more and more underprepared students, learning how our students learn becomes an imperative. In this regard, learning about students' learning styles is "an extremely important element in the move to improve curricula and teaching in higher education" (Claxton & Murrell, 1987, p. 1).

There are several models of student learning preferences, but they all fall into four categories that coincide with what personal characteristics or traits a person uses to learn:

- *Personality models* concentrate on the core characteristics of an individual's personality. These characteristics tend to be the most stable and the ones less likely to change. Because of their virtual immutability, they also lend themselves to more precise assessments. The Meyers-Briggs Type Indicator is a classic tool used to determine this level of personality traits. It is based on Jungian theory that "seemingly random variations in behavior" are actually part of a larger, logical system. Jung believed that people perceive the world either through their senses or their intuition and then reach conclusions or judgments based on either processes of thinking or feeling. The tool attempts to describe an individual's perceptive structures on a continuum from sensing to intuition and their judging processes on a similar continuum from thinking to feeling. The resulting portrait describes how people interact with and make meaning of

their environment. Other personality models include field dependence and independence studies that look at how individuals physically orient their space. If they tend to orient objects with regard to the context of the space, they are field dependent. If they orient objects with no regard to the context of the space, they are field independent. Researchers in this area have theorized that this tendency carries over into social situations (education being one type of social situation). They have concluded that individuals who are field dependent also tend to depend on their current social environment to define their attitudes and behaviors; those who are field independent are more autonomous, having their attitudes and behaviors set intrinsically.

- *Information processing models* focus on how individuals process information. Do they use a global approach and look at several elements at the same time (holists), or do they tend to look at elements separately and create a "whole" meaning through logical, sequential steps? One information processing model is suggested by David Kolb who describes learning as a four-step process of 1) having an immediate *concrete experience* with the information; 2) *reflective observations* of that experience from different perspectives; 3) creating *abstract conceptualizations* , generalizations that are then integrated into sound theories and principles; and 4) *active experimentation* where students tests their learning in more complex situations. Kolb then uses these steps to determine how an individual a) takes in information and b) processes the information to create meaning. Therefore, not only are these four steps a way of observing the process of learning, they can also be used as a continuum on which an individual's preferences for acquiring and manipulating information occur. In other words, a person who tends to grasp information through concrete experience and transform it into meaning through

reflective observation is called a "diverger." Someone who grasps information through abstract conceptualization and transforms it through reflective observation is called an "assimilator." A "converger" is someone who grasps information through abstract conceptualization and converts it to meaning through active experimentation. Finally, an "accommodator" acquires information through concrete experience and transforms it through active experimentation. Other researchers such as Pask, Schmeck, and Gregorc also describe students' learning preferences based on how they acquire and process information (Claxton & Murrell, 1987).

- *Social-interaction models* look at how personal characteristics interact with the social environment to create a learning behavior that the student executes in order to learn. One of the most interesting of these models is based on the research of R. D. Mann at the University of Michigan and classifies learning behaviors into eight different categories based on an assessment of "impulse areas (hostility and affection), authority relation areas (dominance and dependence), and ego state areas (anxiety, self-esteem, and depression)" (Claxton & Murrell, 1987, p. 38):

  1) Compliant students adapt themselves to the will of their teachers, are good at following directions, and are task-oriented; however, they are not necessarily creative or innovative.

  2) Anxious-dependent students are angry on the inside and frightened on the outside. They depend on the teacher for knowledge and, more significantly, support; they are anxious about being evaluated and tend to interpret evaluations as commenting on their value as people. It is difficult for them to engage material independently.

3) Discouraged workers have some high levels of self-esteem but also feel guilty and depressed about their lives. They tend to expend most of their energy looking inside themselves and, as a result, have little sensitivity toward others and little significant engagement with material.

4) Independent students are intelligent and personally secure. They develop individual perspectives easily, but they have little interest in developing any extended personal relationship with the teacher.

5) Heroes see themselves as superior. Engaging in educational activities is an act of rebellion, and although they often help the teacher out when the teacher appears to be in trouble, they will also just as often create conflicts with the teacher that often in the questioning and undermining of the teacher's authority. They are often intelligent and because they are more concerned with the political dynamics of their personal instruction, they tend not to be interested in the material and often receive marginal grades.

6) Snipers are similar to heroes but with much less self-esteem. They see little reason to become involved in class activities and spend most of their time sniping at the teacher in order to create some sense of identity of strength with other students in the class.

7) Attention seekers tend to see learning events as opportunities for social interaction. They often rely on others' standards to determine their judgments and because they are more interested in being noticed, they do not concentrate well on learning activities and tend to receive low grades.

8) Silent students tend to be the largest groups of students in the classes that were studied. Although they are very concerned about how they do in class, this concern is based primarily in their need to use class work as a foundation for their self-worth, and they spend an inordinate amount of time trying to figure out what the teacher wants. They are often angry, suspicious, and paranoid, and even though desperately crave attention from the teacher and their peers, their fear of failure prevents them from becoming actively involved in the process.

Many other social-interactive researchers look at the level of independence in students and how their feelings about and relationships with their teachers, peers, and parents affect how they learn.

- *Instructional-preference models* look at students' preferences for particular instructional methods. Generally, these models look at what happens when 1) students are taught to identify their learning preferences; 2) learn how to capitalize on those preferences in their learning events; and 3) are matched with instructors whose teaching styles compliment their learning styles. Results of some research show that students who have a basic understanding of their preferences and whose learning is personalized to those preferences have "more positive attitude" and even gain greater skill in "reading and studying and college work in general" (Claxton & Murrell, 1987, p. 48). Although it is highly unlikely that each teacher will be able to adapt to the learning preferences of all students in the class, an assessment of learning preferences at the beginning of a course can serve to identify common preferences and suggest the use of one or two teaching styles that be most effective for the majority of the class (Claxton & Murrell, 1987).

There is recent research that suggests cultural expectations and attitudes also play a significant role in how students learn. For example, in many Asian cultures, students are taught to respect both teachers and the learning process so much so that they learn that the only person who has anything worthwhile to say is the teacher; no student should presume to know more than the teacher; therefore, the student has nothing to contribute. These students are taught that the real value in education is learning what those with more experience have to say. Similar to the intellectual cultivation theories in Western education that are teacher/unambiguous knowledge-centered, this approach results in a lack of student responsibility for learning and, therefore, a lack of engagement in the learning process: Students believe that their only responsibility is to acquire the information. Processing the information and creating meaning is done by the instructor and many times, "meaning" is absent from the learning process.

Research into cultural influences on learning behavior has also uncovered different thinking processes that have a direct effect on how students learn. For example, Western thought process (thanks to Plato and Aristotle and reinforced by Newton) tends to be more linear, with a beginning, middle, and end, and cause and effect as the dominant force behind all knowledge (history). Other cultures, however, view knowledge and experience differently. Some cultures view epistemological processes as circular; some see them as spirals; others see history and conscious knowledge as a web, built on interconnections and pathways that can lead to various ends (much like how the brain processes information). We often wonder why many of our students struggle, especially with the critical thinking tasks we engage them in; that might *not* be because they can't think critically. It might simply be the nature of what we are asking them to do—to take the way they have learned to think and translate it without practice or even awareness into a linear thought process that is completely foreign to them.

Research into learning styles has expanded beyond academic applications. Several studies have looked at how learning styles affect the workplace, specifically, how preferences for environmental conditions affect workers' performance (Withnall, 2001). All that we know about learning differences (both cultural and individual) should not suggest that we work individually with every student, developing a different teaching style to reflect each student's preferences. In fact, some research has shown that deliberately mismatching teaching styles with student learning preferences can be effective. Although lower level students appear to benefit the most from matching teacher styles to their preferences, higher level students who already have a beginning facility with critical thinking can benefit from the challenging, multiple-perspective environment created when they are forced to manipulate information outside their particular preferences (Miglietti & Strange, 1998).

What the knowledge of learning styles does and should do is remind us that our classes are a diverse group of learners, and one mode of teaching will not create a learning environment that will support everyone. Multi-modal activities, activities that allow all students to experience the event and express their learning are crucial to the creation of a rich and effective learning-based environment.

History Conclusion

There has always been an uneasy relationship between psychology and education because much of the primary research in both cognitive and behavioral psychology was unable to be applied outside of the limited experiments accomplished with animals (Mayer, 2001a). In addition, the trend in educational practice has been to focus on what the student does; testing is a form of evaluation/assessment that focuses on one kind of performance only, and assumes 1) that this specific kind of performance (a specific set of actions) is the best (if not the only) way to

assess what a student knows; and 2) that *knowing* is the same as *learning*. One argument in defense of this type of limited assessment is, "How do we know what students know unless they show us?" The question itself is valid; the underlying objective (measuring learning) is also a valid objective of the learning process; finally, the process itself (performance-based assessment) is a valid evaluation tool. However, what developmental and constructivist psychology as well as brain research suggest is that there are very complex relationships between knowledge, consciousness, learning, and understanding. Therefore, one definition of learning and one assessment mode is incomplete at best. To view one approach as correct or another as effective with only certain groups of students because that group is not "traditional," is not constructive. The terms "developmental" or "learning-based" have become code phrases that often cause significant negative reactions in many of our colleagues (Spann, 2000). Because of this tendency to judge the effectiveness of an entire educational process based on its title, it is important to look at the practices and the theories that inform the process rather than simply accepting or dismissing an "approach" because it has a certain label that is inaccurate at best. Although a coherent theory of learning has not emerged from the synthesis of these bodies of research yet, some findings are both confirming and expanding what we already know about how people learn.

Adult Learners

Thanks to the diligent work of thousands of theorists and researchers over several hundred years, we know quite a bit about how humans learn; however, we know less about how adults learn. In an attempt to try and determine how all this information applies to adult learners, it is helpful to first determine what this information tells us about learning and intelligence in general.

Most researchers would agree that learning and intelligence is not the same thing. In a broad sense, learning is an automatic process that occurs as we respond to and adapt to our environment; it involves the creation of meaning and is the "primary task of all humans" (Hill, 2001, pg 79; Wambach & Brothen, 2000). This creation of meaning involves biological processes (chemical and electrical) that occur when neurons connect with each other and create increasingly complex networks (Fishback, 1998/1999; D'Arcangelo, 1998). Intelligence, on the other hand, includes the level and quality of an individual's conscious participation *in* that process of meaning-making. It includes how an individual develops an awareness of her individual learning styles and how emotions affect her learning, the ability to question and consciously analyze, and the development of intrinsic motivations to learn (Miglietti & Strange, 1998). Intelligence can also include dispositions toward learning that include curiosity, skepticism, and open-mindedness (Ritchhart, 2001). Finally, concept theorists like Vygotsky add that intelligence is a by-product of the internalization of specific tools such as language, formulae, and symbols that allow for the creation of concepts; this internalization is partly controlled by the individual as she decides how to acquire and use these tools (Karpov & Bransford, 1995).

Since active participation in the construction of meaning, including the ability to use intelligences, tends to increase with age, the way adults learn differs significantly from the way children learn. Here is some of what we know about how learning, meaning-making, consciousness, and experience applies to adult learners:

- Experience is a key. Adults have developed schemata—sets of connected experience—over the years, and the brain uses these schemata to continue to create connections. Children do not have this range of experience; childhood and adolescence are the fertile

fields where this experience is grown. This is significant because research has shown that brain plasticity related to certain skills is greatly reduced by puberty, but the use of schemata is how the brain continues to maintain its ability to make connections far into adulthood (Rose, 1998/1999).

- The learning that children experience is largely "comprehensive and uncensored"; within individual biological limitations, children tend to learn everything they come in contact with. Their learning is also dependent on their complete trust in adults. In contrast, adults are capable of taking responsibility for their learning, including their behaviors that lead to learning and the development of intelligence. These behaviors include the development and articulation of opinions, the control of time, the selection of what has meaning, and the ability to self-reflect and self-regulate (Illeris, 2002).
- Adults have the ability to develop and exercise critical thinking. Critical thinking is self-regulated, self-directed, and self-corrective thinking which adults use to:

  1) raise vital questions regarding issues and problems;

  2) gather and assess information relevant to those issues and problems;

  3) reach reasoned conclusions and solutions which are applied and then tested against relevant standards and criteria;

  4) think openmindedly about alternatives based on the assessment of their conclusions/solutions and the modification of those conclusions/solutions; and

  5) communicate their thoughts effectively as they collaborate with others in developing conclusions/solutions to complex issues/problems

  in order to improve the quality of their thinking and, therefore, their lives (Paul & Elder, 2001).

The ability to exercise critical thinking comprises the accomplishment of several characteristics (abilities) in at least four domains (Paul & Elder, 2001; Paul & Nosich, 1991):

1) elements of thought (skills we use to develop broader critical thinking abilities)
    a) the understanding of and ability to discriminate between different elements of thought including information, concepts, inferences, assumptions, perspectives, and consequences
    b) the recognition of bias, narrowness, and contradiction
    c) the ability to distinguish between evidence and conclusions
    d) the recognition of conclusions that go beyond the evidence
    e) the identification and understanding of assumptions underlying inferences
2) macro-abilities (based on elements of thought, the activities used to exercise higher-order thinking) (Taylor, 2001)
    a) refining generalizations
    b) creating perspective
    c) developing criteria for evaluation
    d) generating and assessing solutions
    e) reasoning dialogically (comparing perspectives, interpretations, solutions)
    f) reasoning dialectically (evaluating perspectives, interpretations, solutions)
    g) listening critically (understanding elements of thought, accurately interpreting, evaluating reasoning of oral communication)
    h) reading critically (understanding elements of thought, accurately interpreting, evaluating reasoning of texts)

i) writing critically (creating, articulating in written form, and evaluating the logic of one's thinking)

j) speaking critically (creating, articulating in spoken form, and evaluating the logic of one's thinking)

3) affective dimensions (attitudes, dispositions, traits essential to development of higher-order thinking)

a) intellectual autonomy

b) fairmindedness

c) exploring thoughts underlying feelings and feelings underlying thoughts (Taylor, 2001)

c) intellectual empathy

d) intellectual integrity

e) intellectual courage

f) intellectual perseverance

g) intellectual curiosity

h) confidence in reason

4) universal standards (criteria used to establish quality of elements of thought, macro-abilities, and application of affective dimensions)

a) clarity

b) accuracy

c) relevance

d) depth

e) breadth

f) logic

g) significance

h) fairness

i) completeness (Taylor, 2001, Paul & Elder, 2001)

It is important to recognize these as abilities and not linear stages of critical cognitive capacities that we often define as sequential like Bloom's Taxonomy: perceiving, knowing, analyzing, synthesizing, applying, and evaluating. The four domains of ability develop the same critical capacities that Bloom's Taxonomy suggests are essential components of critical thought, but they recognize that these abilities do not have to be learned sequentially. Some theorists such as Donald Orlich argue that there does seem to be a sequential process up to (Bloom's stage of) "knowing" (comprehending). After that step is mastered, Orlich contends that a student begins to question, speculate, and even behave with characteristics that mirror the characteristics of behaviors and attitudes at the analysis, synthesis, application, and evaluation levels (Orlich, 1991). Given the right task and an adult's ability to incorporate schemata, it appears possible that several of these capacities can be learned simultaneously.

- Self-regulation, as one aspect of critical thinking, is a result of critical reflection (metacognition) and critical self-reflection:

1) It includes the ability to appraise the need for study, set goals to meet those needs, apply strategies to attain the goals, and assess learning progress (Wambach & Brothen, 2000; Liff, 2003).

2) It includes the ability to develop strategies to "self-soothe" and keep failures and setbacks in perspective (Liff, 2003, p. 30).

3) It is developed in demanding situations, in response to clear, demanding standards and criteria (Wambach & Brothen, 2000).

4) It fosters the evaluative discernment that distinguishes between just doing an assignment and *learning* from it (Wambach & Brothen, 2000; Smittle, 2003).

5) Too much critical reflection may be self-defeating. Since significant learning occurs on a non-conscious level, continuous critical reflection can interrupt natural learning processes. This is especially true in adults who, on the one hand, are more capable of self-reflection and using it effectively to optimize learning events but also have more intrinsic, non-conscious learning behaviors they can trust than children have (Taylor, 2001).

- Self-regulation also includes the ability to delay gratification, to resist temptation. This self-regulation includes the development of critical perspectives, the ability to evaluate and utilize feedback, and the ability to *choose* to focus on a learning task. It also includes the ability to create a self-reward system that facilitates this task focus. This does not mean that adults automatically know how to do this when they enter college; it *does* mean that they have a capacity for it that children do not have (Liff, 2003).
- Although all learning is essentially physiochemical, the creation of connections between neurons, it is much more than just biology, especially in adults. If allowed and encouraged, adults tend to be independent, self-directed, self-regulated learners. That is, they tend to choose to learn about things they are interested in or that have importance for them. This is also a result of a certain level of skepticism that adults might feel about learning something they do not feel the urge to learn (lack of

authenticity). Acquiring knowledge that is deemed useful and authentic (necessary for living) is the main motivation for adults to learn (Hill, 2001; Illeris, 2002).

- Adults tend to internalize these motivations and respond more effectively to them than they do extrinsic motivators such as grades (Abbott & Ryan, 1999; Howell, 2001).
- Because the brain continues to mature into adulthood, its capacities for speed and efficiency also increase. As these abilities continue to increase, so does the possibility for the development of intelligence (Wambach & Brothen, 2000).
- The rate of brain development is not uniform. Therefore, adult students are often at very different levels of cognitive development even though they are the same chronological age (Wambach & Brothen, 2000).
- Although adults often enter learning institutions with a readiness to learn, they are often unprepared academically and psychologically for what is involved in college-level learning (Howell, 2001).

In synthesizing what we know about how adults learn with what we know about cognitive processing (especially constructivism), cognitive neurobiology, and non-intellective learning, here are some implications we can make about adult learning:

- The brain is not like a computer; it simply does not receive input, perform programmed processes on that input, and create meaning. It is a dynamic organ that is constantly creating new, organic connections by combining new stimuli with past experience. These changes in physical structure mean that the brain can always learn, and, as long as it continues to be challenged, its learning can become increasingly more efficient (Hill 2001).

- Formal instruction is foreign to the way the brain learns. Its learning is an automatic reaction to its environment and its single goal is survival. Therefore, learning must take place in an authentic context that has both meaning and interest to the individual (Reardon, 1998/1999; Illeris, 2002; Miglietti & Strange, 1998). As a result, focusing simply on content or approach can be counterproductive (Reardon, 1998/1999).
- The brain learns by making physical connections between existing information and past experience (schema). Because people's experiences are different, so are their brains. Including adult students in the creation of authentic learning experiences (experiences that have meaning for them) is essential to the brain's ability to make connections (Hill, 2001; Jensen, 2000; Reardon, 1998/1999; Mayer, 1998; Stover, 2001).
- Embedding learning in authentic contexts mirrors the brain's own tendency to create context for meaning-making. Delivering content devoid of real-world context is not only more difficult but less effective (Hill, 2001; Hardiman, 2001; Reardon, 1998/1999).
- Because the brain processes information in different regions simultaneously looking for patterns, we learn better when we are exposed to stimulation that engages multiple brain functions. Therefore, engaging the brain in higher level thinking tasks (analysis and synthesis) as well as multiple learning styles dramatically increases the effectiveness of the learning event (Hill, 2001). The richer and more challenging the learning environment, the more patterns the brain is able to create. This enrichment includes multiple contexts (e.g., texts, social interaction, self-reflection) as well as multiple learning strategies (e.g., visual, auditory, kinesthetic) and the lack of threat (Abbott & Ryan, 1999; Reardon, 1998/1999).

- Patterns and connectedness are also reinforced by practice. The more often the brain makes the same connection (i.e., experiences the same concept or performs the same task), the stronger that particular neural pathway becomes and the higher the probability the experience will be embedded in long-term memory. Because information does not last longer than a few days at best in short-term memory, embedding information and connections in long-term memory is essential to the future creation of other neural pathways and networks (D'Arcangelo, 1998; Taylor, 2001; Reardon, 1998/1999; Fishback, 1998/1999; Keivipermann & Gage, 2002; Howell, 2001).
- Patterning is profoundly affected by emotions and is state dependent. Because this patterning is a physiological process, anything that affects physiology inhibits or enhances the brain's ability to make connections (e.g., stress, fear, joy) (Reardon, 1998/1999; Jensen, 2000; Liff, 2003)
- In making its connections, the brain is influenced by logic (Abbott & Ryan, 1999) as it perceives and creates discrete parts of knowledge and also larger networks of meaning from those discrete parts of knowledge (Reardon, 1998/1999).
- Social collaboration enhances the development of connections. In social interaction, the brain is able to make connections and establish patterns between differing opinions and perspectives, making it easier to store the information/concept/skill that is the focus of the collaboration (D'Arcangelo, 1998; Wolfe & Brandt, 1998; Reardon, 1998/1999; Abbott & Ryan, 1999; Wambach & Brothen, 2000).
- Like social collaboration, emotions strengthen link between learning and memory. Emotions not only aid in selecting what information is important (acting as a filter for what stimuli will actually be used to create connections), they also aid in cementing the

learning event in long-term memory. Generally, the stronger the emotion, the firmer it is embedded. There is a degree at which emotions become counterproductive: If there is too much fear or stress attached to the event, the brain might choose to embed it deep enough in long-term memory as to make it all but inaccessible (Hill, 2001; Taylor, 2001).

- Learning is both a conscious and a non-conscious process. Since learning is a natural process of the brain, it does not need conscious manipulation of that process to create a quality learning event. Although high quality learning is often a result of conscious processes and behaviors like critical reflection, not all quality learning can be consciously controlled (Taylor, 2001)
- Learning involves both focused attention and peripheral attention. Focus and attention are essential components of conscious, self-regulated learning. Focus fluctuates with brain chemistry, which occurs at 90 minute cycles across a 24 hour period. Optimal attention spans can be generally determined by taking our age, plus or minus two minutes, up to a maximum of 20-25 minutes. For example, a student who is 20 will have an average attention span of 18 to 22 minutes (D'Arcangelo, 1998; Reardon, 1998/1999).
- Critical thinking includes the ability to apply strategies to problem-solve as well as the development of abilities and attitudes that lead to effective self-regulation.

Some Conclusions of Adult Learning

- Learning research does not *prove* anything about educational practice. However, we need to know what research tells us about thinking, knowing, and learning so as not to be confused, become victims of educational fads (Jensen, 2000; Wolfe & Brandt, 1998;

Miller, 2003; Rose, 1998/1999; Taylor, 2001; Caine & Caine, 1990; Mayer, 1998). Just because we know how adults learn doesn't mean we know how to teach. Effective instruction is the process of applying relevant theory and practices in the classroom and measuring the results (Jensen, 2000)

- Because learning is a complex system of processes and behaviors, there is more than one way for students to display what they know—what they have learned.
- The focus of instruction should be on quality—authenticity (real-life contexts, interest, engaging multiple cognitive processes (linguistic, spatial, visual, emotional)
- The theory of multiple intelligences and learning styles supports the fact that the brain learns by accessing diverse areas of its experiences to create connections in response to challenging stimuli (Bibb, 1998)
- Learning involves four general capacities: knowing (how we acquire info), thinking and feeling (two aspects of the how we process info and create meaning), and doing (how we apply meaning)

Adult Learning-Centered Approach: Templates

(see Appendix B for a condensed version of these templates)

Combining what we know about how people learn and create meaning (specifically how adults learn) and what we know about how the learning process is influences, we can begin to draw some general conclusions about what adult learning in our classrooms should look like. Any approach to effectively teach adults must focus on at least seven areas:

1) my perspectives and beliefs as an instructor

2) the environment

3) the substance of learning (what I want students to know, think, do, feel)

4) the activities I will use that will allow students to acquire and demonstrate their learning

5) how I will measure the learning

6) how I will evaluate the effectiveness of the learning process

7) how I will use the results of the evaluation of the process to modify the process and make it more effective (Wambach & Brothen, 2000; Reardon, 1998/1999)

In examining these elements, it might be helpful to re-define the concept of "approach" or "pedagogy" in order to create a label that more precisely represents what we do with adult learners. Malcolm Knowles argues that the term "pedagogy" ("the art and science of teaching children") should be replaced with the more accurate "andragogy" ("the art and science of helping adults learn"), a term that has been used by European educators since the 1960's (Knowles, 1984, p. 6). With that in mind, the development of any effective andragogy should, at least, address the above-listed elements.

1. My perspectives and beliefs as an instructor: What do I think about adult learning? (Instructor Readiness)

Before constructing a learning-based environment, there are several attitudes and perspectives an instructor should consider. These attitudes shape the learning environments we create and profoundly affect the quality and the quantity of learning that takes place. Therefore, as a learning-centered adult educator, I understand that:

- instructional design is grounded in a combination of established theory, research into adult learning, and experience. It is not simply based on my own experience as an instructor (Land & Hannafin, 2000; Mentkowski and Associates, 2000; Jensen, 2000). Just because a certain design or approach worked well for me (or I was brilliant

enough to be able to learn from *any* approach in *any* setting), doesn't mean my students can (Reardon, 1998/1999).

- the decisions I make in my class regarding activities, texts, grading, even how I interact with my students, reflect my understanding of how adults learn (D'Arcangelo, 1998).
- most adult students can and will learn anything they choose to learn (Hill, 2001; Claxton & Murrell, 1987; Land and Hannafin, 2000).
- although some adult learners have been conditioned in previous educational environments to be helpless and compliant, their natural inclinations and experiences outside the classroom indicate that they are self-directing—they possess an intrinsic responsibility for their own learning (Land and Hannafin, 2000; Knowles, 1984).
- because adults enter educational settings with a large volume of diverse experiences, one of the greatest resources for learning in the adult classroom is the learners themselves, especially because adults use their experience as a significant resource in the development of their identity (Knowles, 1984).
- readiness to learn is as significant as the learning event itself. Adults develop a readiness and motivation to learn when they believe that what they will learn will help them in some aspect of their lives (Knowles, 1984).
- because adults are motivated to learn based on how they see the learning event addressing a specific aspect of their life (e.g., satisfying an emotional, psychological, or intellectual need in order to live in a more satisfying way or to solve a problem), they seek learning activities that address these aspects of their life (Knowles, 1984, p. 12; Maslow, 1970).

- because adults are usually motivated to seek out learning experiences that satisfy deeper intellectual, psychological, and emotional needs, these adults should be included in all aspects of learning. This includes the creation of outcomes, criteria, activities, and assessments. By involving students in these processes, they develop a firmer commitment to the learning process and refine characteristics of self-regulation that are essential to developing higher levels of thinking.
- although adults will occasionally respond to extrinsic motivations to learn (e.g., job advancement, professional recognition, or grades), the more profound motivations that lead to lasting learning are intrinsic and personal (e.g., self-esteem, self-confidence, and self-actualization) (Knowles, 1984; Merriam & Caffarella, 1991; Maslow, 1970).
- learning is a complex process involving conscious and non-conscious processes and is influenced by the learner's environment, experience, emotions, and needs. Therefore, adult learning comprises what the learner knows (including content, strategy, and skill knowledge), how the learner thinks (including critical, metacognitive, and information manipulation processes), how the learner feels (including motivations for learning and how the affective domain influences the quality and permanence of the learning), and what the learner does (including use of cognitive strategies and behavioral performance)
- although I might have difficulty understanding how emotions influence the production of meaning, reasoning, and critical thinking, I understand that focusing on students' feelings is not only *not* a waste of time, it can give me significant insights into what and how they are learning

- although the goal of learning is generally to acquire knowledge in order to survive, the more sophisticated goal is to use acquired knowledge to create meaning in order to experience a higher quality of life that begins with a more grounded and satisfying sense of self.

2. The environment: What conditions will I create in order to enhance the natural learning process?

Learning occurs within an environment. The nature of the environment can either enhance or inhibit the quality of learning that occurs. The environment (including physical, emotional, and psychological), therefore, is just as important to the creation of meaning and learning as the knowledge (content) that is being acquired and manipulated. But if the brain is so adaptable and it continues to learn efficiently outside classroom settings, "Why do I need to worry about the environment in the classroom? No one controls the environment outside the classroom, and the brain seems to feed on that type of challenge." Unlike outside the classroom, the classroom itself is an artificial world; context is removed once we enter the door. Therefore, context must be re-established in order for effective learning to occur. Part of establishing that context in the classroom is the creation (re-creation) of a context-rich environment that is interesting, authentic, challenging, and as low-stress as possible (Hardiman, 2003).

Physical Environment

Although this is often not under our control, there are some things we can do to enhance natural learning:

- Arrange furniture to suggest that knowledge can come from and learning can occur in several locations within the physical structure of the space rather than just from one (e.g., from the front). Because natural learning occurs as different types of stimuli are

processes simultaneously, the physical arrangement of the room can reflect this condition of multiple and dialogical information transmission (Knowles, 1984, p. 15). Move lectern/table to a corner and deconstruct the "rows" of tables or desks to eliminate the expectation that knowledge (often accepted as "truth") will only come from the front of the room ("the teacher"). Because chalkboards, white boards, screens, and tables/desks are often fixed, create writing/communication spaces on the walls with large paper and move among these, allowing students to move among them as well Donald, 1997).

Psychological/Affective Environment

- Process not structure—An environment conducive to natural learning actually comes more from process and activities that occur within the learning space rather than from structure of the learning space itself (Jensen, 2000).
- Mutual Respect—Adults learn best when they are valued. If they are ignored or talked down to, they will tend to spend more energy dealing with the feeling of alienation than they will focusing on their learning (Knowles, 1984)
- Collaborativeness—Learning from our environment and from other people in the environment is natural. Although many educational experiences have taught us to compete for attention and grades, our natural learning environment is rich with diverse stimuli, and that is why we must deconstruct the competitive nature of our learning environments encouraging students to interact with their (environment) in order to negotiate multiple perspectives and develop higher level critical thinking skills (Land & Hannafin, 2000; Knowles, 1984).

- Mutual Trust—We learn more from those we trust than from those we don't. Since teachers are usually viewed as authority figures with power over students' time (in the form of assignments) and their futures (grades), we must make a concerted effort to create trust (Knowles, 1984). Even though the learning environment must be challenging in order to stimulate the brain's ability to create connections and find patterns, that challenge must occur in safety or the resulting stress, specifically fear, will inhibit or even destroy the learning opportunity (D'Arcangelo, 1998; Reardon, 1998/1999).
- Supportiveness—We learn better when we are supported and valued. That support comes in the form of specific, critical feedback and affective encouragement from both instructors and peers (Knowles, 1984).
- Openness and Authenticity—Being open and honest is one of the keys to developing the risk-taking behavior that is required for the development of higher levels of thought (which include critical reflection and critical self-reflection). Modeled by the instructor, students can learn that they don't have to pretend that they know in order to protect their self-esteem—that being honestly aware of what we know and don't know, what we are capable of and what we want to learn is the foundation of a critically discerning mind (Knowles, 1984).
- Pleasure—Although learning is often difficult, it can also be fun. Especially because the learning experience becomes one of the many experiences adults use to develop identity, the pleasure associated with learning increases the likelihood that the learner will develop to her potential (Knowles, 1984).

- Humanness—Above all, learning is a "human" activity. Not only does learning involve interaction with other people, the very processes of learning make us human. We develop not only sense of who we are and what we are capable of, we also develop personal value and the sense that caring and tolerance is essential to being human. These values are not just developed through specific and respectful interactions with others and the conscious acquisition of knowledge about the characteristics of being human; they also result from our attention to simple details of human comfort like lighting, ventilation, and even the frequency and duration of breaks (Knowles, 1984).

Instructional Design Environment

This is, perhaps, the most problematic aspect of environment design. Although it certainly affects the physical and psychological/affective domains of the environment, the instructional design component is an overarching set of criteria that guides the instructor in all aspects of the learning process including the creation of outcomes and activities, the evaluation of the student learning, and the evaluation of the learning process itself. These criteria are designed, generally, to ensure that I not only know *what* I am doing, but *why* I am doing it, and whether or not it works. If it doesn't work, how do I improve it, and if it does, how to I repeat it and improve it? Even though these criteria are the basis for many other aspects of the learning process, they are presented here because they should be considered *prior* to the creation of any outcomes, activities, or assessments (Land & Hannafin, 2000):

- Is my andragogy (the process[es] I will use) grounded in a defensible and acknowledged theoretical framework? It is clear that although our experience as instructors is one of our best gauges of effectiveness, practices based in adult learning

theory can focus our efforts more productively, more efficiently (Land & Hannafin, 2000; Mentkowski and Associates, 2000; Hill, 2001).

- Are these processes consistent with outcomes resulting from research that is designed to test and validate the extension of these theories to instruction? So often, we hear about a new theory or even just results of a particular body of research without realizing that sound instructional practice must be the result of research that results in theory, the theory then tested, a theoretical framework created, the framework applied, the results evaluated, and, finally, an instructional application is born. A good example of this is the virtual tidal wave of information about brain-based learning that is bombarding education today. Just because I think I know how the brain works, the relative infancy of the research process means what I *think* I know is actually very little. In addition, just because I *think* I know how the brain learns doesn't mean I know how *all* individuals learn. Finally, just because I *might* understand how adults learn does not mean I know how to use that information to teach. Research into learning must result in learning theories, and those theories must be applied and evaluated before any attempt can be made to design instruction based on those theories.
- Are my processes transferable? In other words, can they be adopted by other instructors with similar results?
- Can I measure, evaluate, and validate the effectiveness of my processes? If my processes involve vague, unsupportable, or generally non-subjective characteristics, then it is difficult to ensure learning quality across diverse student groups and learning events. This is not to say that, like the behaviorists, if I can't quantitatively measure *every aspect of the event*, then the experience is invalid. But I should be able to

measure change or growth either quantitatively or qualitatively in order to validate the process. For example, one way to measure affective change is to ask students how they feel about their ability to write or solve equations at the beginning of a course. Their responses could be indicated on a continuum from "not very confident" to "very confident." The students could be asked to evaluate their confidence after each assignment as well as at the end of the course. The observed changes are qualitative but are also a significant gauge of how the students feel about their learning and how those feelings have *changed* over the course.

3. The substance of learning: What do I want students to know, think, feel, or do? (outcomes)

Even the most skeptical of us will admit that our attitudes and the learning environments we create have *some* effect on the quality of learning that occurs in our classes. And although these elements have a more significant influence on how and what our students learn than we might first believe (or might even be willing to consider), there is very little doubt that what we want our students to learn is the primary focus of our efforts. Even though we might disagree about *how* our students should be taught (how *they* learn) and even how we measure their learning, the fact that we want them to learn *something* cannot be disputed. So, how do we go about articulating what we want our students to know? Or even more basically, why articulate it at all?

As I look back at my first years of teaching, I am appalled at how much I took for granted about my students' learning and my teaching. For example, I taught basic sentence structure and word types because I assumed that 1) these were things that were taught in English classes, and 2) I learned them, and I became a competent writer, so my students should learn them too. After a few years, I even began to develop a more reflective view of my teaching and began to

understand that, maybe, these pieces of information I was *giving* to my students might actually *help* them become better writers, even though I still did not have a clear notion of what "good writing" meant outside of the correct and developed articulation of specific writing modes like cause and effect or comparison. As I began to watch other teachers who had a much clearer idea about what they were doing than I did, I began to realize that they actually operated under the guidance of goals and objectives they had designed for their classes: They had specific skills and knowledge sets they taught their students that were actually smaller components of a larger set of skills and knowledge that would, eventually, satisfy the requirements of the course as established by the department, division, and institution, who themselves were often satisfying requirements mandated to them by other institutions (that our students might transfer to), the state, and the federal government. Wow! To be able to break down all of those requirements and objectives into semester-length, then monthly, then weekly, and even daily objectives was a revelation to me.

So, I tried it. . . . And it worked, for a while. Then I began to notice something—I was so focused on what I wanted to teach (what I was supposed to be teaching) that I had forgotten (actually, I had never really considered) what I wanted the students to *learn*. I assumed that what I was teaching was what they needed to learn, but as I became more and more concerned about giving them detailed and supportable explanations about why certain things in their writing were inadequate or incorrect, I found myself coming up short. I mean, I could explain that their paper was a "D" because it had too many run-ons or was not coherent, but I had difficulty explaining why these things even mattered in the first place.

It was at that point that I mounted a concerted effort to objectify my evaluation process as much as possible. My hope was that by articulating clearly what I wanted and why I wanted it,

students would have an easier time mastering these skills rather than just responding to comments like, "This is vague; make it clearer" or "too many run-ons here." Little did I know that what I was actually beginning to do was create criteria for abilities (competencies, skills) that I thought the students needed. I began feeling better about my teaching, and many students began commenting about how much they liked my classes because I was so clear: I told them exactly what I wanted from them.

I continued in this mode for a year or two as I refined my criteria and the evaluation sheets that contained them, watching my students' grades get a bit better and reducing the number of issues I had to deal with on first submissions. Then, I hit another andragogical wall: Why was I doing all this? On one hand, I was under contract to teach students skills and knowledge based on the requirements set down by my department, division, et al; on the other hand, what was I really preparing the students for *and* was I really concerned about *their* learning or *what I* was teaching? I had no answer. Although I believed that learning how to write made my students "better," more "educated" (especially as critical thinkers) and, therefore, more likely to be "successful," I'm not sure I had a clear idea of what I meant by "successful" and that all the hours they were spending with me, and their other instructors, were profoundly productive.

I needed to be able to connect what I was teaching to 1) the abilities I wanted my students to possess and display, and 2) more general, transferable abilities that I was sure would serve them beyond the classroom. I needed to articulate what I believed a "successful" human being was, join that to what I was being contracted to teach (eventually filtering the requirements of the latter through the characteristics of the former), and decide what I wanted my students to be able to do. As a result, I would not only have continuity between what I was teaching and what my students were learning, but I would be able to finally define my vocation—my belief that I have

been called to teaching to help improve the quality of people's lives. Little did I know at that time that I was on the verge of creating outcomes for the learning that occurred in my classes—outcomes based on localized, discipline-specific abilities and the more general abilities I saw as being characteristics of participants in a progressively humane society (Freire, 1970).

From an instructional design standpoint, outcomes are the engines that drive the learning process. Everything we do in the classroom is derived from what we want our students to know, think, feel, and do—both within our disciplines and as people within a society. The articulation of outcomes is also imperative because adults have not only a significant stake in their own learning, they have profound control over it. Life-long learning cannot be accomplished without the adult learner's explicit participation in the learning process. The articulation of outcomes allows adult learners to see not only exactly what abilities they will be developing but *why* those abilities are important to them *personally*. Can learning occur without these elements being articulated? Yes, probably; however, the quality and longevity of that kind of learning is highly suspect.

It might be helpful at this point to establish a few definitions related to outcomes so that they, and the elements associated with them, are not confused with characteristics of other teaching approaches:

- outcomes: the expected end-ability; what you want the student to be able to know, think, feel, or do
- criteria: the specific characteristics of an ability/outcome
- competences: personal qualities and characteristics that the learner calls upon in diverse contexts

- competencies: discrete tasks that are performed in specific contexts (Alverno College Faculty [ACF], 1994)

Although these terms look like terms that are used in more traditional approaches, they belie an underlying philosophical difference between many traditional approaches and an outcomes-based approach to learning:

- Outcomes focus on what the student is able to know, think, do, and feel. Traditional approaches tend to focus only on what students are able to do. Therefore, an outcomes-based approach more closely resembles the way adults learn—multi-modal, multi-domain, and multi-sensory.
- Outcomes focus on the students' learning. Traditional approaches tend to focus on *what* is to be taught. In an outcomes-based model, learning activities are only created *after* the desired ability is clearly articulated through the creation of criteria; the focus is on the ability, and, therefore, the student's learning. Therefore *what* is taught (or, more specifically, *how* the student experiences the knowledge that will lead to the practice and acquisition of the specific criteria and, ultimately, the ability itself) is a result of focusing on the student rather than the teacher.
- Outcomes are certainly specific, but they are always related to more generic, applicable life skills. Traditional approaches often focus on discrete skills as being important "in and of themselves." In other words, I might explain to my class that knowing how to use commas is important to becoming an effective writer. This may be true, but an outcomes-based approach would take the explanation one step further—Being an effective writer will allow you to more clearly communicate with those around you, thus enabling you to reach your personal goals more effectively.

In order to create measurable outcomes, I must:

A) Establish the ability. An ability is:

- integrated—it involves a set of components including behavior, skills, knowledge, values, dispositions, and self-perceptions. For example, to be an effective writer, one must be able to apply prewriting strategies that include the use of specific tools such as brainstorming, listing, and outlining/clustering in order to generate specific, interesting, and supportable ideas; be able to create clear, concise sentences and arrange those sentences coherently in order to articulate the desired ideas; be able to self-evaluate the writing product including revising its content and structure and editing its mechanics in order to ensure a specific, coherent, supported, and interesting product. Beyond the development of the ideas themselves, an effective writer must be able to put the product in a form that can appropriated by an audience, so the writer must have an ability to transfer the product to an appropriate medium (typed, word-processed, or handwritten medium, or some other visual, aural, or tactile format). This writer must also possess an accurate knowledge of his capabilities in order to ensure a quality product. In a general sense, this same writer must also value communication (or someone or something) enough to *want* to do create a quality product. It is these separate components of the ability that we use to create the criteria that define the ability (see below).
- developmental—teachable. Rather than viewing "developmental" as remedial or applicable only to at-risk student populations, ability-based instruction simply views developmental as something that is learned, and, therefore, something that can be taught. Learning occurs as the student builds on previous experience and knowledge, *developing* increasingly more complex relationships between knowledge sets, and *developing* increasingly more complex

and effective skills. Because learning is developmental, teaching is developmental. In the student's process of constructing and reconstructing knowledge and meaning, the teacher provides critical feedback, multiple perspectives, and additional knowledge that result in the student taking more complete control of her own learning processes.

- transferable—usable in diverse roles and contexts. For example, although learning how to brainstorm (ask questions in order to generate ideas as well as specific support for statements and propositions) is essential to becoming an effective writer, this process of critical questioning is the foundation for the development of critical thinking. Knowing how an ability transfers to a student's life is a crucial consideration in the articulation of abilities and the creation of the criteria that define them.
- separate from other abilities—don't bundle outcomes. For example, it is confusing to suggest that a student "critically read and effectively respond to the text." Critical reading and effective response are two separate outcomes with their own distinct set of criteria.

B) Articulate the criteria that define the ability. Criteria:

- act as indicators that the ability has been exercised. They can also be called a "standard" and are observed during the performance of an ability. As the student performs the indicated ability, the student, peers, and instructor are able to view how many (if any) of the criteria have been displayed. The number of criteria observed serve as a gauge of how well the ability is exercised. (This is discussed in more detail in "How will I assess the learning?" below, but at this point, it might be helpful to know that the *number* of criteria a student displays for each ability can be used to determine the quality of the ability. For example, it could be established that a student must display at least three of the four criteria for the ability *each time* the ability is performed in order to be considered as having

successfully displayed the ability. It could also be established that the student will have six chances throughout the course to display this ability. If there are four criteria that define the ability, then the student will actually have the opportunity to display the criteria twenty-four different times. It could be established that in order to have successfully displayed the ability, the student would have to have displayed twenty instances of the criteria [out of twenty-four possible instances] in order to be considered as having displayed the ability.)

- can be one of two types, classified as such by their level of specificity:

  *_components_ or _generic criteria_ provide a general idea of what the ability means. For example, in a writing class, a generic criterion might be that the student uses specific examples from texts to support a point. Generic criteria assist us in determining the instrument or process we will use as an activity. Generic criteria are what we typically see at the course or program level

  *_specific criteria_ transfer the generic criteria to a specific context or instrument. Using the above example, a specific criterion might be that the student uses at least one quote from Kate Chopin's *The Awakening* to support each point in his paper. Specific criteria point us to exactly what to look for in the student's performance of an activity to determine whether or not the student has accomplished this particular characteristic/element/standard of the ability. Specific criteria are what we typically see at the class level—how individual instructors interpret the course outcomes in relation to their specific texts and andragogies.

- must be able to be performed. The essential nature of an ability is that it can be performed. If we are interested in knowing whether or not a student can think critically, we must be able to observe them think critically; if we want to know whether a student understands the process of mitosis, we need to be able to watch them explain it. The contexts in which

students perform (and we and their peers are able to observe and assess them) can be varied, but they should be contextualized as much as possible to resemble situations students will find themselves in outside our specific classes and the institution itself.

- must be appropriate to the student's level within the educational process and the discipline. Although learning environments must be challenging, there are different levels of competency and engagement. For example, although as learning-based educators we believe that an essential component of the learning process is the adult student's ability to control her own learning, we would not expect a student new to college or a student returning to higher education after a substantial absence to be knowledgeable about, let alone practiced at, self-directed learning. Even though we believe that adults naturally tend to engage in self-directed behavior, their ability to reflect on and evaluate their learning processes may not be articulated to the point that the ability can be consciously activated. This is why we must not only recognize but specifically assess our students' past exposure to, current knowledge of, and capacity to perform the criteria of the abilities we establish to ensure the development of appropriate criteria, applicable activities (contextualized learning events), and assessments.
- should be clearly separated from directions. Some directions might include whether an essay is typed or handwritten, whether it is double-spaced, whether the math homework shows all the steps in the problem-solving or not. Of course, if one of the criterion being measured is the ability to follow directions, or you are using the steps in the math homework as evidence of a specific problem-solving technique, then these could be considered criteria.

With these characteristics in mind, there are some general considerations for creating criteria:

1) Is the criterion appropriate for the level of the student(s)?
2) Does the criterion describe the ability I want the student to demonstrate?
3) Can the student self-assess based on this criterion?
4) Could the criterion be satisfied in more than one way?
5) Could another person (student, faculty, administrator, other professional) assess the student's performance according to this criterion?

(ACF, 1994; Loacker, 2000; Marzano, Pickering, & McTighe, 1993; Smith & Levin, 1996; Goleman, 1998)

4. The activities: What opportunities will I provide for students to acquire and demonstrate the ability?

Our abilities are a direct result of the learning activities we are involved in (Howe, 1998). These activities can be anything from a short writing assignment, to a lecture, to a lab experiment. The more effective the learning activity, the more profound and long-lasting will be our learning. Although not all of these criteria are necessary for each activity, for a learning activity to be effective, it should:

- introduce knowledge or skills related to the outcome or allow practice of *one or more* of the criteria for that outcome (Goleman, 1998)
- promote meaning-making through the engagement of students in authentic activities (Land & Hannafin, 2000; Knowles, 1984). An authentic activity is one that:
    1) is based in real-life (everyday) experience (Land & Hannafin, 2000). This development of context is crucial for the creation of connections and the networks of patterns (schemata) that allow adults to create meaning. Although we know that adult learning takes place as the brain makes connections between the knowledge

being acquired and previous experience, sometimes previous experience can lead to naïve and incomplete thinking or even faulty theories which, in turn, can interfere with learning. This is why it is important to assess a student's knowledge prior to engaging in a learning activity. It might be necessary to create other activities that precede the main activity in order to re-create personal experience, creating a more accurate and deliberate readiness in the student (Miglietti & Strange, 1998).

2) is created in conjunction with learners in order to ensure the creation of meaning, increase their commitment to the learning process, and increase their ability to apply the process of assessment to their own learning, thus facilitating self-regulation (Land & Hannafin, 2000; Knowles, 1984).

3) results in increased intrinsic motivation; intrinsic motivation increases the likelihood that the learning will be embedded in long-term memory.

4) is challenging—creating multiple and/or unique approaches to problem-solving that includes multiple solutions and perspectives (Land & Hannafin, 2000; D'Arcangelo, 1998). This can include collaborative activities in which learners interact with each other in an attempt to both introduce multiple perspectives but also learn how to negotiate and evaluate those perspectives to create meaning. Challenging can also mean "messy"; linear learning, which is one of the dominant characteristics of formal learning environments, is often less likely to produce lasting learning. Challenging learning can include the use of multi-modal activities that challenge students to think outside their practiced learning preferences (Miglietti & Strange, 1998). As long as students are given specific feedback and quality downtime to process information [see below], non-linear activities (those that highlight more

subtle, less obvious connections) can be more effective at promoting long-lasting learning (Casazza, 1998).

5) involves discovery (Merriam & Caffarella, 1991; Lawton & Saunders, 1980). When I lecture, I use my own schemata and neural networks to deliver the information. The students might be able to acquire the information I give them, but whether learning takes place or not is questionable. In order to ensure learning that is embedded in long-term memory, students must use their own schemata and neural networking to manipulate knowledge (Zull, 2004).

- is established on an assessment of the student's current ability/knowledge in relation to the criteria *before* the activity is designed and implemented (Goleman, 1998). This allows the creation of an activity that targets the appropriate criteria. If the student lacks the knowledge or ability to engage in the activity, then some scaffolding might have to occur in order to prepare the student for the activity. Using this assessment to gauge readiness might be a little more problematic because readiness (which involves knowledge, ability, motivation, and value) is often difficult to assess. Some researchers even suggest that readiness is a "non-issue" in that you can determine a student's readiness by how the task is completed: If she performs the task she was ready; if she doesn't, she was not ready (Kirby & Biggs, 1980). Although this perspective does not lead us to understanding *why* the student was not ready or *what* can be done to prepare the student, it does suggest that perhaps the use of pre-activity assessment should focus primarily on developing a sense of the student's ability level in relation to the criteria in order to design a more accurate and useful activity.

- includes interaction between student and instructor or between student and student that is active not passive (D'Arcangelo, 1998; Bibb, 1998).
- includes downtime because of short-term memory limitations. Learners need time to make connections and store those in long-term memory (D'Arcangelo, 1998; Reardon, 1998/1999; Jensen, 2000). This downtime does not have to be long (10-15 minutes) nor does it have to be defined by the absence of activity. It *does* need to be characterized by the absence of new information. A good downtime activity could be to have students take a few minutes to write down one or two things they just learned and one or two things they are still confused about. This same exercise could also be conducted orally, as a whole class or even in small groups.
- is modeled (Reardon, 1998/1999; Hardiman, 2001; Goleman, 1998).
- includes encouragement of and opportunities for practice (Reardon, 1998/1999; Hardiman, 2001; Goleman, 1998), including processes of trial and error (Jensen, 2000).
- is implemented using a combination of approaches/modes (D'Arcangelo, 1998; Claxton & Murrell, 1987; Mentowski & Associates, 2000; Donald, 1997).
- includes feedback that (Goleman, 1998):

  --is criteria-centered (ACF, 1994)

  --encourages and reinforces (Knowles, 1984; Goleman, 1998; ACF, 1994)

Activities can serve at least two purposes:

1) as opportunities to introduce and practice ability-based criteria
2) as actual, graded measures of the performance of the ability

We must make sure to provide students with enough practice to gain facility with the criteria, and we must make sure we make it clear when the activity is practice or when it involves a formal, graded assessment.

5. The measure: How will I assess the learning?

Once outcomes (abilities) are established and defined by criteria, activity instruments can be constructed that can be used to provide the opportunity to practice the criteria or act as the context in which the criteria will be formally assessed and judged (graded). Although there is a tendency to create the assessment instruments at the same time the criteria are being created, a specific assessment should only be created *after* it is clear 1) what instrument (activity) is being used to contextualize the criteria, and therefore, 2) what the specific criteria will look like within that context. For example, if one of the outcomes for my English 1A class is that students can respond effectively to a text, I might establish a criterion of "respond effectively" that articulates the use of appropriate (related) quotations from the text as support. However, until I know which text will be used in the specific activity, I cannot create an assessment that measures whether a quotation is appropriate or not. Therefore, even though I can develop a general idea of how I want my assessments to look as I create my outcomes, I cannot develop specific assessments until I have determined the activity/context in which the abilities will be performed.

There is also a tendency to confuse outcomes with activities. In traditional design models, the term "standard" (which is sometimes used to refer to outcomes as well as criteria) is often used in a less specific sense to refer to anything the instructor wants the student to do. This means that a standard can be used to refer to a *general* ability, for example "demonstrate effective mechanical skills," or to a *specific* activity, for example "fix run-ons and fragments." The first, more general use of "standard," is often referred to as a "content standard" because it

describes a skill or ability related to a specific content area. The second, more specific use of the term, is referred to as a "curriculum standard" because it describes a specific activity within the content area "that might be used to help students develop skill and ability within a given content domain" (Marzano, Pickering, & McTighe, 1993). They are not interchangeable: A curriculum standard (activity) allows a student to acquire understanding of and practice a specific example of the larger, transferable content standard (ability). In this case, fixing run-ons and fragments might be an activity that allows students to understand and practice the criteria that characterize the larger ability "effective mechanical skills"; however, even if students can successfully perform the activity (correct run-ons and fragments), this does not mean that they have mastered *all* the criteria that characterize that ability. The distinction between these two uses of the concept "standard" and the way the concept is used in relation to the creation of outcomes is crucial. I know from experience that if I am not careful, I might create *activities* (curriculum standards) when I should be creating *criteria* (characteristics of outcomes). If I do confuse these processes and create an activity instead of a criteria or a criteria-based outcome, when I assess it, I will only be assessing the student's ability to perform that specific activity. I will *not* be able to judge whether any ability (or a specific criterion that defines that ability) has, in fact, been performed—because this activity, that I have confused with an ability, is not connected to any ability at all; it only refers back to itself as the standard of performance.

Where activities are the context in which knowledge and ability are fused and developed, assessment is how this fusion and development are measured. This measurement focuses on *how* the student has already developed as well as *what* the student can do to develop more, not on what the teacher has provided to the student in the process. This is what differentiates assessment from testing. Testing focuses on possession—how much knowledge given to the

student the student still possesses. Assessment, on the other hand, focuses on how the student *uses* the knowledge she has acquired (ACF, 1994).

In designing assessments, I want to consider that effective assessments:

- are based on criteria that define an outcome (ACF, 1994; Loacker, 2000) rather than a specific curriculum that is not outcome-specific (D'Arcangelo, 1998).
- are based on evidence that criteria have been performed.
- are based on evidence of performance that might take more than one form (Is there more than one way for the student to provide evidence of the ability?).
- are based on explicit criteria that are published and readily available to the students.
- measure what a student knows, thinks, feels, or does.
- are created in conjunction with learners which results in the learner's increased commitment to the learning process as well as in his increased ability to apply the process of assessment to his own learning, thus facilitating self-regulation.
- include assessments by peers. Collaboration is a key to adult learning and should involve more than just the instructor and specific student. This is not meant to suggest that all assessments *must* include the student's peers. There are times that require shorter, more personal assessments that time or the student's individual needs might require. However, whenever possible, assessments should involve at least a small group of peers to increase the possibility of multiple perspectives in addition to the repetition of modeled assessment behaviors.
- include feedback from instructors as well as peers. Feedback not only provides specific information regarding the performance of the ability, it also models self-regulatory mechanisms such as critical reflection and critical self-reflection. It reinforces what a

student already knows while allowing the student to acquire more information and expertise that will motivate modifications in understanding and behavior, thus increasing ability (capacity building).

- include self-assessments. Besides self-assessments being one of many perspectives of performance, self-assessments allow the student to practice self-regulation. What good is learning if it evaporates once the student leaves the classroom? Although developing the ability to effectively self-assess is often a chore (students run out of time, don't see the value, are so used to the only valuable assessment as the one that comes from the teacher), it is an invaluable component of active learning and the development of self-regulation. Self-assessments should be clear and limited. They can address a specific criterion and can include metacognitive reflection on the student's performance and processes leading up to that performance.
- include a characteristic of externality. A simple way to think about this characteristic is that it involves the application of a caring perspective on the part of the instructor. It involves the delivery of assessments in a caring yet constructive way that allows the student simultaneously to view her performance critically and within the context of prior performance. Externality promotes:
  - *a student's ability to see her performance from within (personal judgment) and from without (as others would judge it).
  - *the development of distance for both the instructor and the student. They view the assessed performance within the context of previous performance in order to understand whether the performance is typical or unique, how much development has occurred, and how much more development can/needs to occur.

*the view that the assessment of single performance event is one piece of information that is used to determine a student's overall ability. One performance is not evidence that the student has either mastered the ability or not mastered it. This creation of overall performance perspective reduces stress and anxiety, and, instead, can turn an unsuccessful performance of ability into a successful assessment of how the performance can be improved to meet the criterion.

Externality reminds us that students need multiple opportunities to perform abilities, in multiple modes (if appropriate).

- are cumulative. That is, assessments cannot be "averaged" in an attempt to determine a student's performance level. They should encourage the student to build on what she knows by incorporating previous understanding within the current assessment instrument. By reinforcing experience and by clearly showing how the student is developing (or even hindered in his development), the student is more confident in developing more complex uses of his knowledge and becomes actively engaged in creating a network of understanding an ability as opposed to discrete, unrelated skills.
- are expansive. Psychologists and neurobiologists tell us that a challenging environment is one of the keys to profound learning. Students must be challenged to the extent of their capabilities in order to learn. An assessment that is expansive is always pointing the student toward higher levels of performance. It is crucial that instructors recognize when students exhibit abilities that are beyond the skill level of the criteria they are performing. For example, as a student is showing how she identifies and corrects run-ons, she might articulate a problem-solving process that meets the criteria for another outcome (e.g., one containing critical thinking criteria) at a higher level. Or a student who is describing his

> writing process might include in that description an explanation of how he values writing, where he sees good writing as an important ability in his life. This ability to value might be present as a higher level criterion in another, affective, outcome. We must view the student's performance holistically, not just as a fused whole; this includes assessing *all* elements of their performance based on the established criteria rather than trying to attenuate peaks and valleys of their performance in an attempt to simplify our management of their learning and *our* teaching.
>
> (ACF, 1994; Loacker, 2000; Marzano, Pickering, & McTighe, 1993; Smith & Levin, 1996; Goleman, 1998; Kirby & Biggs, 1980; Knowles, 1984; Boylan, 1999; Seybert, 2002)

When instructors first start working with criteria-based outcomes and assessments, they often have trouble transferring the notion of whether a student meets the criteria for a particular outcome or not into a grade that they are required to report to the institution. For example, I do not think that Mt. SAC Admissions would be very excited if I wrote on my grade sheets "meets criteria" or "does not meet criteria" instead of "C" or "D". Translating from criteria-based to grade-based is not difficult, and each teacher eventually discovers a process that works. Many instructors simply create at least two levels for each criterion: "does not meet criterion" and "meets criterion." They then decide how many times the student will be able to demonstrate her ability with the criterion over the course of the class—in other words, how many activities will involve the formal assessment of the criterion. Then the instructor sets a limit for each of the levels. For example, if a criterion will be formally assessed five times in the course (and it could be practiced many more times), an instructor could set "3" as the "meets criterion" threshold for a "C." That is, out of those five opportunities, the student will have to show ability with the criterion at least three times to be judged as having displayed satisfactory ability with that

criterion by the end of the course. Any number less than three would result in a "does not meet criterion" assessment.

Then, to determine the overall grade in the course, the instructor could simply set a threshold of a certain number of "meets criterion" for a "C", a certain number for a "B", and a certain number for an "A". Here's how this might work.

Let's say I have two outcomes for my class with three criteria defining each outcome—that's six criteria. Then, suppose I had five practice activities and five formal assessment activities. (In determining my grades, I would only consider whether the criteria were met in the formal assessment activities, not the practice activities.). Now, each of the five formal assessment activities might not involve the performance of all criteria; in other words, I might not ask the student to show evidence of all six criteria in every formal activity. However, within all five formal assessment activities, each criterion will be performed at least four times. If I set the threshold for a minimum grade at "3" (which is 75% of the 4 formal opportunities the student is given), that means that the student must successfully show evidence of meeting each criterion at least three out of the four opportunities (out of the five formal assessments) they participate in. If we multiply 3 (the threshold) by 6 (the total number of criteria), we arrive at 18: that is the total number of "meets criterion" assessments a student must receive (a "meets criterion" assessment for three out of the five formal assessments) in order to receive a "meets criteria" for the entire course and, thus, receive a passing grade (see table 1.1 below where "X" indicates in which activity the student will have to show evidence of that particular criterion):

Table 1

			Formal Assessment Activities					
			1	2	3	4	5	Total
Outcome #1 Responds to text effectively	Criteria	1. Addresses topic	X		X	X	X	4
		2. Develop topic		X	X	X	X	4
		3. Use grammar rules to achieve clarity	X	X	X		X	4
Outcome #2 Can apply structure effectively	Criteria	4. Use topic sentences		X	X	X	X	4
		5. Create body with supporting details		X	X	X	X	4
		6. Explain how details support topic sentence		X	X	X	X	4
						Total		24

Now, in order to determine a "B" or an "A," we must determine how many total "meets criterion" assessments a student could receive if she showed evidence of "meets criterion" for *all* criteria (6) in *all* formal opportunities (4 out of 5): 24 "meets criterion" would be the most this student could receive. If this student obtained 24 "meets criterion" assessments, that would mean she met the criteria for each outcome in *every* formal assessment activity. It is now just up to the teacher to decide where the "B" range is and where the "A" range is. An explanation of how the criteria assessments could be articulated into grades on a syllabus could look like this:

- In order to receive a "C" in the course, you must meet the criteria for each outcome 75% of the time. In other words, you must receive at least three "meets criterion" assessments (that's three out of the four formal assessments) for each criterion by the end of the course (for a total of 18 "meets criteria" assessments).
- In order to receive a "B" in the course, you must receive at least three "meets criterion" assessments for each criterion (75%) *and* at least two more "meets criterion"

assessments (for any of the criteria) for a minimum total of 20 "meets criteria" assessments.

- In order to receive an "A" in the course, you must receive at least three "meets criterion" assessments for each criterion (75%) *and* at least four more "meets criterion" assessments (for any of the criteria) for a minimum total of 22 "meets criteria" assessments.

Another variation would be to set separate limits for each criterion. This would be necessary if I believed that some criteria needed to be performed more consistently in order to receive a passing grade in the course (see Table 2 below).

Table 2

			Formal Assessment Activities					
			1	2	3	4	5	Total
Outcome #1 Responds to text effectively	**Criteria**	1. Addresses topic	X		X	X	X	4
		2. Develop topic		X	X	X	X	4
		3. Use grammar rules to achieve clarity	X	X	X	X	X	5
Outcome #2 Can apply structure effectively	**Criteria**	4. Use topic sentences	X	X	X	X	X	5
		5. Create body with supporting details	X	X	X	X	X	5
		6. Explain how details support topic sentence		X	X	X	X	4
						Total		27

In this example, I have increased the number of opportunities to show evidence of criteria 3, 4, and 5 from four opportunities (formal assessments) to five (all five formal assessments). This means that the student has one more opportunity for each one of criterion 3, 4, and 5. However, because I have increased the total amount of criteria-based opportunities by three, if I want to

maintain my 75% "meets criteria" standard, I will have to increase the number of required "meets criteria" assessments by one (for a total of four) for each one of criterion 3, 4, and 5. Therefore, in order to receive a passing grade, the student must still receive a minimum of three "meets criteria" assessments for each criterion 1,2, and 6 but now must also receive *four* "meets criteria" assessments for criterion 3, 4, and 5. I will also slightly increase the total number of "meets criteria" assessments required for the "B" and "A" level in order to compensate for the increase in the total number of criteria-based opportunities.

6. The evaluation: How will I assess the effectiveness of the learning process?

One of the most difficult things to do as a teacher is practice what I preach. If I ask students to manage their time effectively in order to complete their assigned tasks, I have to exercise the same discipline in my management of class time and my grading and prompt return of their work. If I ask students to be open-minded about concepts, modifying their behaviors, and considering the perspectives of others, then I must exercise the same open-mindedness in my relationships with students, colleagues, and peers. If I expect my students to think critically, then I must model that process. What better way to do that than in the design and implementation of my andragogy. One aspect of critical thinking is to "think openmindedly about alternatives based on the assessment of their conclusions/solutions and the modification of those conclusions/solutions" (Paul & Elder, 2001). In that regard, I would not be applying critical thinking if I did not reflect on the quality of the learning occurring in my classes. Therefore, I need to be able to measure *and* evaluate what occurred either during an activity or over a series of activities, including an overall evaluation of the learning that occurred within the entire course. In doing that, I should ask myself:

- Based on my established template, have all the criteria been satisfied for:

*my personal beliefs and attitudes

*the creation of a learning-based environment

*the creation of outcomes

*the creation of activities

*the creation of assessments

- How were the outcomes related to authentic life events?
- How did the criteria articulate the outcomes?

*Were the criteria specific?

*Do the criteria represent the ability I want the student to demonstrate?

*Were there any criteria missing?

*Were there too many criteria?

*Were the criteria modeled?

*Did the students understand the criteria?

- Was the activity appropriate?

*Was it a reasonable context in which to demonstrate the criteria?

*Did the students require any scaffolding or pre-activity process to prepare them for the activity?

- Did the assessments measure the criteria?

*Were the abilities being measured reasonable for the level and experience of the students?

*Could the students self-assess based on the criteria and their performance?

- Was there a specific group of students that demonstrated a higher level of ability than another?

- Were there any mitigating factors within the environment (including the time frame of the event, temperature, external events, or pressures) that could have affected the activity?
- Have I asked the students what they thought *and* felt about the event?
- Am I allowing the students to observe this reflective/evaluative element of my own learning process as a model?
- Can I include a colleague in my reflection and evaluation in order to develop a more objective appraisal of the process?

7. Application of evaluation: How will I modify the learning process to improve it?

Once I have reflected on the process and content of the design of my learning event, I am now able to modify it to increase its effectiveness. As I review my design templates and ask the preceding questions, I can focus on specific aspects of the event that can be modified. As I do this, I must remember one thing: Outcomes-based learning is a *forgiving, flexible* process. Even if a criterion or activity turns out to be imprecise or too broad or too complex, the students will still have engaged in a significant learning process that I (and the students) can modify it almost immediately in order to ensure the effectiveness of the subsequent activity. The ability to evaluate the learning based on specific criteria and in real-time (with each activity or learning event) means that the opportunity to demonstrate criteria-based abilities is never lost and the learning process continues to be dynamic and authentic. In fact, involving students in the process of discovering why a particular activity or assessment was not effective might, in itself, not only satisfy criteria for another outcome but most assuredly reinforce higher-level critical thinking skills that are often a broader, embedded goal of our outcomes.

Conclusion

As learning-based educators, we believe students can and will learn. This idea is difficult to embrace even in the best of circumstances. But as community college educators, our circumstances are not ideal and are continuing to change. The number of underprepared students is continuing to increase. Every semester we receive more students who were marginally successful in previous academic environments. Part of this increase is due to more students needing more skills in order to survive in the workplace. Another reason is that four-year institutions are formally removing themselves from any instruction that is defined as "not college level." There are political as well as educational and economic factors fueling this trend, and, as instructors, we might have little influence on those factors (Damashek, 1999a; Damashek 1999b).

At the same time, technology is influencing not only how we deliver our instruction but what types of experiences our students bring to our classrooms. While many of our students have a certain degree of technological savvy, they have few critical skills and abilities that allow them to discriminate what is valuable from what is vacuous. "Remediation" is on the rise—or at least the need for it is. Almost every community college in the country is struggling with how to take up the slack left by the abandoning of underprepared students by four-year institutions (Ignash, 1997). Unfortunately, we see remediation through "developmental" programs as a burdensome necessity, a necessity that consumes voluminous amounts of human, economic, and spatial resources; we see it as burdensome because we have incorrectly drawn a line between two types of students—those who have huge deficits and those who don't. What we need is a different view—a view that defines *all* student potential not by what they *don't* have but what they are capable of. A view that sees *all* educational practice as "developmental" in that *all* learning is based on previous learning and experience. This includes:

- redefining what Mt. SAC defines as developmental to include *all* courses at *all* levels
- vigorously identifying, encouraging, and rewarding successful learning-based andragogies and their components
- a commitment to hiring faculty and staff who have a true developmental view of learning
- embedding sound, learning-based values and practices in every level of the institution—from the classroom to the president's office
- clearly defining both general criteria for critical thinking as well as discipline/course-specific criteria
- making a commitment to student learning by embracing those processes and best practices that have been proven to increase the quality of student learning, including but not limited to outcomes-based andragogies (including outcomes-based activities and assessments) and comprehensive assessments of learning processes and the processes that support them at all levels of the institution
- making a commitment to a climate that encourages and supports individual instructor's efforts to challenge their existing notions of education and provide a platform to allow for investigation and experimentation
- an understanding of the complexities of diversity and the development of tools and strategies to address it effectively
- developing a climate where first and foremost, the student is valued as being a responsible and capable peer in the learning process

(Smittle, 2003; Damashek, 1999a; Damashek, 1999b; Ignash 1997; Boylan 1999)

We need not only to trust our students to learn, we need to begin trusting ourselves—that *we* are capable of becoming the professionals we are called to be; that, like our students, we *can* learn—how to teach diverse student populations; how to be effective with our time and resources; and how to create learning environments and activities that facilitate profound learning. Our situation is only going to become more challenging, and our response should be to change whatever we need to in the structure of our institutions, in the support resources our students access, and in our own professional development to ensure that our vocation and the "ontological vocation" of our students are supported and realized.

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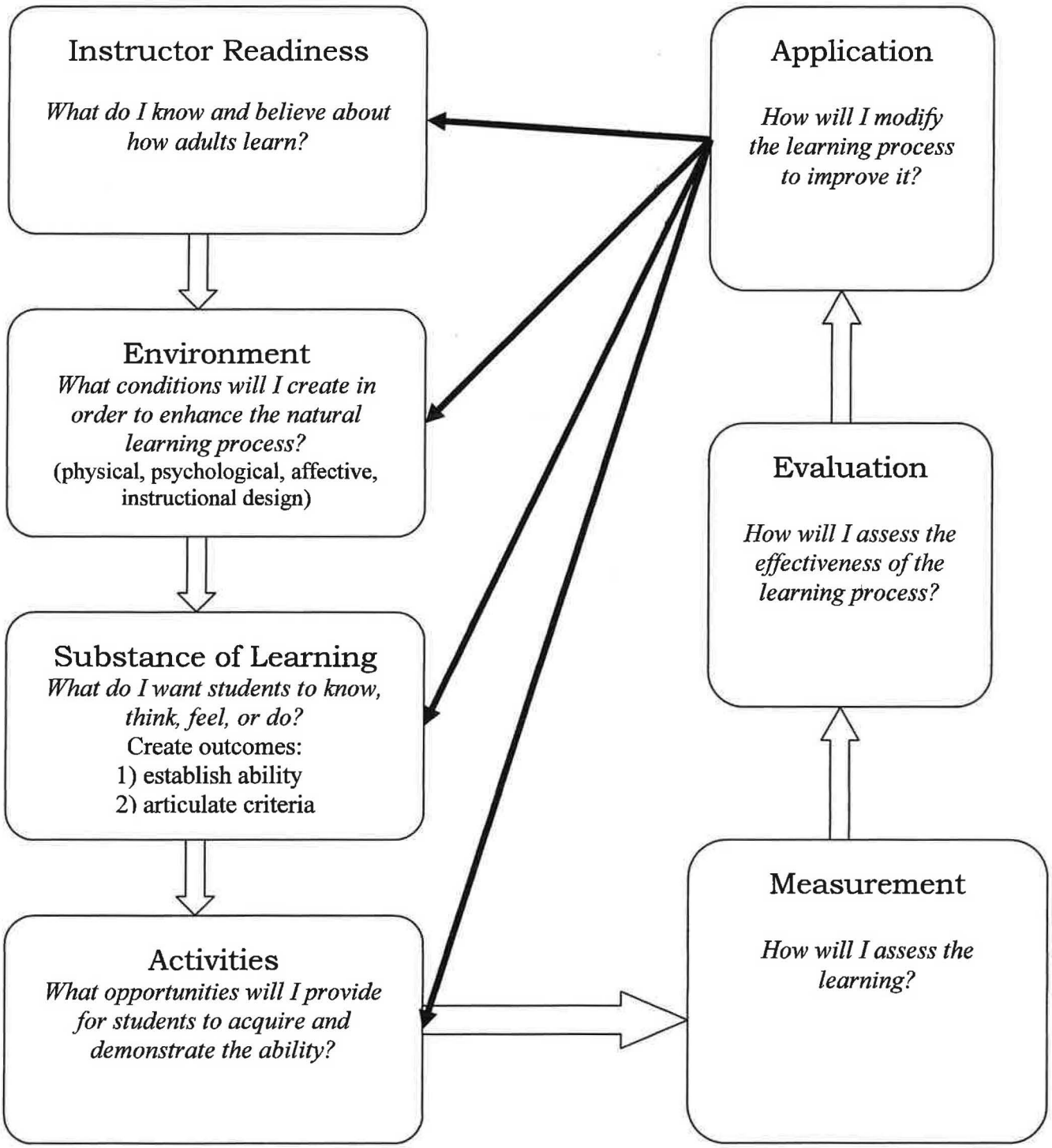
Appendix A

Diagram1. *General Schematic of Learning-Based Instructional Design*



Appendix B: Templates

Instructor Readiness Template

1) Does what I am about to design in class have a basis in established, theory, or practice, including my previous practice with students that I have measured and evaluated as being effective?
2) What does what I am currently doing tell me about how I think my students learn?
3) Do I understand that my students can learn anything they choose to learn?
4) Do I understand that my students can and will take responsibility for their learning?
5) Do I understand that my students' experience is a valuable resource in the learning that will take place in this course?
6) Can I make it clear how what my students will be learning is important to them?
7) Do I understand that my students want to learn?
8) How will I encourage my students to participate in *all* aspects of the learning process?
9) How can I encourage the intrinsic motivation to learn instead of relying on extrinsic motivators?
10) Have I considered what I want my students to know, think, feel, or do in the creation of this tool or as I approach this class session?
11) Do I understand that working effectively on some level with my students' emotions will only enhance the natural learning process?
12) Do I understand that, essentially, my students are here because they want their lives to be better?

Environment Design and Evaluation Template

1) Does/did the physical structure of the classroom reflect the type of learning I want to take place?
2) Will/did I create a climate of mutual respect?
3) Will/did I encourage and provide opportunities for my students to collaborate in their learning?
4) Will/did I create a climate of mutual trust?
5) Will/did I support the students' learning and provide feedback that values their process?
6) Will/did I model openness and honesty and encourage the same in my students?
7) Can/did I make the learning experience pleasurable?
8) Will/did I model caring and tolerance and encourage the same in my students?

General Instructional Design and Evaluation Template

1) Are/were my processes grounded in a defensible, acknowledged theoretical framework?
2) Are/were these processes consistent with outcomes resulting from research that is designed to test and validate the extension of these theories to instruction?
3) Are/were my processes transferable?
4) Can/did I measure, evaluate, and validate the effectiveness of my processes?

Outcomes Design and Evaluation Template

General

1) Are/were the outcomes integrated? (Do they comprise several, connected criteria?)
2) Are/were the outcomes developmental? (Can the abilities be taught?)
3) Are/were they transferable? (Can they be used in other contexts?)
4) Are/were the outcomes unbundled? (Am I articulating *only one* ability at a time?)

Criteria

5) Do/did the criteria for each outcome thoroughly articulate the ability?
6) Are/were the criteria generic or specific? Which one do I want?
7) Can/could the criteria be reasonably performed?
8) Are/were the criteria appropriate for the level of the course?
9) Are/were the criteria appropriate for the students' skill level?
10) Are/were the criteria clearly separated from the directions of the activity?
11) Can/did the student self-assess based on the criteria?
12) Can/did the student demonstrate satisfactory performance of the criteria in more than one way?
13) Can/did another person assess the student's performance according to this criterion?

Activities Design and Evaluation Template

1) Does/did this activity introduce knowledge or skills specifically related to one or more criteria?
2) Does/did the activity allow for the practice of or demonstration of ability in one or more criteria?
3) Is/was the activity authentic?
    a. Does/did it occur within a context that connects to a context outside the classroom?
    b. Is/was it created in conjunction with the students?
    c. Does/did it result in increased intrinsic motivation?
    d. Is/was it challenging?
    e. Are/were students able to express their understanding of the criteria in more than one way?
    f. Do/did students experience discovery?
4) Are/were the elements of the activity based on an assessment of the students' current skill/knowledge level?
5) Is/was scaffolding required? (Will I need to provide background information or the chance to practice prerequisite skills before I implement the activity?)
6) Does/did the activity require active participation of the students?
7) Does/did it include downtime for processing?
8) Is/was the activity modeled?
9) Does/did the activity include opportunities for practice?
10) Is/was it implemented using a combination of approaches/modes?
11) Does/did it include feedback?
    a. Is/was the feedback based on the criteria?
    b. Does/did it encourage and reinforce the students?
    c. Can/did it occur in different forms (modes)?

Assessment Design and Evaluation Template

1) Is/was the assessment based on criteria that define an outcome rather than a curriculum?
2) Is/was the assessment based on evidence that criteria have been performed?
3) Is/was the assessment based on evidence of performance that might take more than one form?
4) Is/was the assessment based on explicit criteria that are published and readily available to the students?
5) Does/did the assessment measure what a student knows, thinks, feels, or does?
6) Is/was the assessment created in conjunction with the learners?
7) Does/did the assessment include assessments by peers?
8) Does/did the assessment include feedback from the teacher?
9) Does/did the assessment include self-assessment?
10) Does/did the assessment include a characteristic of externality?
11) Is/was the assessment cumulative?
12) Is/was the assessment expansive?
13) Was there a specific group of students that demonstrated a higher level of ability than another?
14) Were there any mitigating factors within the environment (including the time frame of the event, temperature, external events or pressures) that could have affected the activity?
15) Have I asked the students what they thought *and* felt about the event?
16) Am I allowing the students to observe this reflective/evaluative element of my own learning process?

Can I include a colleague in my reflection and evaluation in order to develop a more objective appraisal of the process?

Appendix C: Web sites

Adult Learning-Based Web Sites

Adult Learning

- http://honolulu.hawaii.edu/intranet/committees/FacDevCom/guidebk/teachtip/adults. A very practical site in the Honolulu Community College intranet. This address connects you to a faculty home page that describes characteristics of adult learners and suggestion how, as an instructor, we can enhance learning for adults.
- http://honolulu.hawaii.edu/intranet/committees/FacDevCom/guidebk/teachtip/teachtip.htm. This is the home page for the above site. It has some very interesting links for faculty including what to do on the first day, how to do deal with stress, motivating students, and effective questioning
- http://www.gse.harvard.edu/~ncsall/. This is the NCSALL home page (National Center for the Study of Adult Learning and Literacy. This center is a joint effort of Harvard University Graduate School of Education, World Education, Rutgers University, Portland State University in Oregon, and the Center for Literacy Studies at the University of Tennessee in Knoxville. Some good links to current research directly related to adult learning.
- http://www.About.com. This is a great site for so many things. Use the "Browse by Topic" feature at the bottom left of the page to search for your topic alphabetical. (For example, a search under "A" for "Adult Education" will yield http://adulted.about.com/cs/learningtheory/index.htm?terms=adult+learning.) This is also a great resource for your students' research.

- http://cudenver.edu/~mryder/itc_data/theory.html. This is a University of Colorado at Denver School of education site that discusses and has links to learning theory.
- http://tip.psychology.org/. A great site for turning Theory into Practice (T.I.P.). It provides an overview of learning theory and how to translate that theory into instructional practice.
- http://funderstanding.com. A great resource for students and teachers. There is some good info here on adult learning and general learning theory. Some links include multiple intelligences, constructivism, and social cognition theory.
- http://www.studygs.net/adulted.htm. This is an interesting site that is written *to* the adult learner. It is based on what research shows about how adults learn and so explains to the adult learner what she should expect from her learning experience and what her responsibilities are. There are also some good resource links for adult learners.
- http://www.infed.org/biblio/b-learn.htm. A great introduction to learning theory and how it can apply to instruction.
- http://el.hct.ac.ae/Educ/Learn/EdPsy.html. A great list of links to learning theory. You need to wade through it a little because the adult learning theory is not separated from general theory. Also, there are some good links at the bottom of the page to specific psychological learning approaches.
- http://www.calstatela.edu/faculty/jshindl/teaching/lstyle.htm. This is a site dedicated to the discussion of learning styles. Although this is a site designed for the teaching of children and young adults, it has some good links in the upper left corner to various learning styles theories and inventories.

- http://www.psychology.org/links/Paradigms_and_Theories/. A link from psychology.com, this is an encyclopedia of essential psychological theory including cognition, behavior, and neuroscience.
- http://psychology.about.com/library/weekly/aa091500a.htm. A good, encyclopedic psychology site. There are links to different types of psychological approaches with overviews of the approaches and biographies.
- http://www.personalityresearch.org/. The psychology of personality includes discussions of emotions, behavior, and cognition. Some good overview links for these areas.

Outcomes

- http://www.aahe.org/assessment/principl.htm. The American Association of Higher Education's statement on assessing student outcomes. It lists principles of good practice for assessment.
- http://www.ksu.edu/apr/Learning/HowTo.htm. A basic guide to writing student learning outcomes. This particular process is based on Bloom's classification of cognitive skills and related behaviors, but it is easy to substitute other abilities (since Bloom's is really designed for educators' instructional application not for the defining of student abilities)..
- http://depts.washington.edu/grading/slo/SLO-Assess.htm. The University of Washington's description of how to assess outcomes. A nice feature of this site is that it gives numerous ways to assess outcomes other than written tests.
- http://www.wwu.edu/depts/assess/slo.htm. A great site of links to "must read" web resources concerned with outcomes and their assessments.