Adult learning in various academic disciplines
by Myrna Maxine Doney

A thesis submitted in partial fulfillment of the requirements for the degree of Doctor of Education
Montana State University
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Abstract:
This study was concerned with understanding how learning occurs and knowledge is organized and processed by professors in various academic disciplines in higher education. The study focused on university professors in four different academic content areas to examine the preferred approaches to learning within and between disciplines.

Although the university structure and the development of the college disciplines have been studied, there has been very little research done on the impact of the academic discipline on learning and teaching in higher education. Knowledge of the consequences of the disciplines on learning would be helpful information for the total educational community.

The sample for this study was purposive. Twelve university professors were selected from four different disciplines for this research. The design chosen for this inquiry was a naturalistic study using qualitative study methods. The criteria for selection of the professors were teaching experience in one of the four academic disciplines; peer recognition from within the academy for professional expertise, insight, and interest in their own learning and the learning of their students; depth and breadth of their professional experiences to contribute to the data of interest; and interest in the project. The four college disciplines selected for the study were physics (hard science), history (humanities), music (arts), and business management (applied science). Extensive, informal interviews with the professors were used as a means of collecting data for this study.

The findings showed differences in the learning strategies and knowledge organization skills used by the professors in the four disciplines. Factors of measurability, interpretation, and application shape the distinctive foundation for these academic disciplines. It was concluded that university professors can benefit from self-awareness of preferred learning strategies and from the awareness of discipline specific learning differences across the campus. Teaching practice for college professors can also be positively influenced by the knowledge of discipline specific learning strategies. The data of this study can also impact discipline specific learning for university students.

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of the requirements for the degree

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APPROVAL

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Myrna Maxine Doney

This thesis has been read by each member of the graduate committee and has been found to be satisfactory regarding content, English usage, format, citations, bibliographic style, and consistency, and is ready for submission to the College of Graduate Studies.

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Date 4-16-97

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ABSTRACT

This study was concerned with understanding how learning occurs and knowledge is organized and processed by professors in various academic disciplines in higher education. The study focused on university professors in four different academic content areas to examine the preferred approaches to learning within and between disciplines.

Although the university structure and the development of the college disciplines have been studied, there has been very little research done on the impact of the academic discipline on learning and teaching in higher education. Knowledge of the consequences of the disciplines on learning would be helpful information for the total educational community.

The sample for this study was purposive. Twelve university professors were selected from four different disciplines for this research. The design chosen for this inquiry was a naturalistic study using qualitative study methods. The criteria for selection of the professors were teaching experience in one of the four academic disciplines; peer recognition from within the academy for professional expertise, insight, and interest in their own learning and the learning of their students; depth and breadth of their professional experiences to contribute to the data of interest; and interest in the project. The four college disciplines selected for the study were physics (hard science), history (humanities), music (arts), and business management (applied science). Extensive, informal interviews with the professors were used as a means of collecting data for this study.

The findings showed differences in the learning strategies and knowledge organization skills used by the professors in the four disciplines. Factors of measurability, interpretation, and application shape the distinctive foundation for these academic disciplines. It was concluded that university professors can benefit from self-awareness of preferred learning strategies and from the awareness of discipline specific learning differences across the campus. Teaching practice for college professors can also be positively influenced by the knowledge of discipline specific learning strategies. The data of this study can also impact discipline specific learning for university students.

CHAPTER 1

INTRODUCTION

Background of the Problem

> Human beings are learning creatures; we are always learning. It matters not our age or address, our income level or the color of our skin. We learn from the moment we first draw breath until the moment when we breath our last. (Apps, 1992, p. 7)

Not until the early 20th century did educational theorists begin to consider learning as a lifelong process. Prior to the publication of *Adult Learning* in 1928 by Thorndike, Bergman, Tilton, and Woodyard, the accepted theory of learning from contemporary research was that the intelligence of adults declined as a function of age and thus the learning process was arrested after adolescence (Merriam, 1993, p. 6).

Much of this early concept of learning was the based on research work by educational psychologists during the first half of this century. The methodology used in this early adult learning research was a comparison of adult learners with younger learners in the results of timed intelligence tests in an attempt to better understand the effects of aging on the function and measurement of intelligence. The initial results showed that the younger learners performed better on the tests and therefore it was concluded that intelligence and the ability to learn decreased with age. However, when the

paradigm of the research was shifted from examining the rate of learning (speed) to examining the ability to learn (intelligence), new conclusions were drawn that adults, up to age 70, did as well as younger adults (Merriam, 1991, p. 48).

The breadth and focus for adult education research expanded during the last half of this century. The interest in understanding human intelligence has not diminished, but other aspects of human learning have also drawn attention. Cognitive development, the internal mental structure and processes of the human mind, including insight, information processing, memory, perception has been researched. The memory function of adults has been of special concern as researchers looked carefully at the effects of aging on the ability of an adult to process and retrieve information and problem solve.

Recently a more comprehensive and holistic approach to learning has developed. This perspective has been cultivated to understand the affective as well as intellectual dimensions of human learning.

> The latest concerns of some educational, cognitive, and developmental psychologists, which holds the most promise for our understanding of learning in adulthood, involve consideration of experience, personal history, and social and cultural contexts. (Merriam, 1993, p. 7)

Abraham Maslow's theory of motivation based on his hierarchy of human needs, progressing from basic physiological needs to satisfy hunger through meeting the ultimate human need to reach the highest possible personal potential, self actualization, integrates the humanist theory into adult

learning. Maslow stresses the impact of life experiences on learning in adulthood.

> Self-actualization does not occur in young people. In our culture, at least, youngsters have not yet achieved identity, or autonomy, nor have they had time enough to experience an enduring, loyal, post-romantic love relationship. Nor have they worked out their own system of values; nor have they had experience enough (responsibility for others, tragedy, failure, achievement, success) to shed perfectionistic illusions and become realistic; nor have they generally made their peace with death; nor have they learned to be patient; nor have they learned enough about evil in themselves and others to be compassionate; nor have they had time to become post-ambivalent about parents and elders, power and authority. (Maslow, 1954, p. 54)

Jack Mezirow's (1991) theory of perspective transformation addresses learning by "recognizing the central role played by an individual's acquired frame of reference through which meaning is construed and all learning takes place" (p. 8). He posits that we must be critical of the effect of presuppositions we bring to learning.

> As adult learners, we are caught in our own histories. However good we are at making sense of our experiences, we all have to start with what we have been given and operate within horizons set by ways of seeing and understanding that we have acquired through prior learning. (p. 11)

The learning phenomenon is now considered to be dynamic and span the lifetime of human beings. It is a process in which we as human beings become engaged in order to satisfy curiosity; affirm intellectual and personal competence; maintain job and family; process information, feelings, and behaviors; pursue mental stimulation; and explore personal interests.

> What lifelong learning seeks to do is to provide a framework within which an individual can reflect on the past and prepare for

> the future in terms of learning experiences. It seeks to alert individuals both to their environment and to the growth potential from every experience. (Long, 1990, p. 29).

The subject of human learning has dominated educational inquiry since the early philosophical investigations of Plato and his contemporaries, and the pursuit continues for an even deeper understanding of human learning. Each contribution in the research of adult learning increases our understanding of the complex and multifaceted phenomenon.

> The effort to understand learning is at once fascinating and frustrating — fascinating because of the complexity of the phenomenon, frustrating because this same complexity defies simple description.
>
> It is doubtful that a phenomenon as complex as adult learning will ever be explained by a single theory, model, or set of principles. Where we are headed, it seems, is toward a multifaceted understanding of adult learning, reflecting the inherent richness and complexity of the phenomenon. (Merriam, 1993, p. 12)

The enigmatic nature of the human mind and our inherent need to understand perhaps generates the perpetual interest in the learning process in general, and the focused effort in adult learning specifically. Podeschi (1987) observed, "empirical research cannot resolve philosophical questions, nor dissolve the philosophical assumption of the researcher" (p. 14).

As long ago as 1916, John Dewey, the proponent of the progressive education movement, talked about the relationship of formal education to the process of life long learning and the experiences of the learner.

> Education must be reconciled, not as merely a preparation for maturity (whence our absurd idea that it should stop after adolescence) but as a continuous growth of the mind and a continuous illumination of life. In a sense, the school can give us

> only the instrumentalities of mental growth; the rest depends upon an absorption and interpretation of experience. Real education comes after we leave school and there is no reason why it should stop before death. (Dewey, 1916, p.25)

Although many facets of formalized academic learning have been subjected to educational research, very little is known about the importance and impact of the academic disciplines on teaching and learning in higher education. "Observers have long noted that academicians study everything but themselves" (Clark, 1987, p. 2). The "college discipline" as an institutional entity has had the attention of researchers. Issues concerning the academic profession of teaching and the design and development of the departmentalized and specialized academic structure are covered in the literature.

> The academic profession is shaped by many social settings: the discipline or field of study is one of them. The profession takes a different shape in physics than in political science, in biology than in classics, in engineering than in education. Thus we must pursue the disciplines and search for similarities and differences across them. (Clark, 1987, p. 2)

The mechanics of the organization and structure of the units of educational study and the purposes and perspectives that originated the separate fields of study have been explained (Ebel, 1983), but little attention is evident in the literature toward how students and faculty learn within the content areas.

In the editor's notes, Hativa (1995) describes the urgent need for examination of the effects of the academic discipline on teaching and learning. The definitive structure and authoritative rigor of the college and university

academic discipline has been strongly defended from within the academy for years but subjected to minimal research scrutiny. More substantive information on the importance and impact of the content area would be helpful to students and faculty to increase their effectiveness in teaching and learning, and also to administrators and program planners to be more effective and efficient in making decisions.

The very limited work that is reported in the adult education literature is mainly concerned with the differences in disciplines from three perspectives: methods of knowledge validation within the academic discipline, student evaluation of classroom teaching practices, and the study methods students use in diverse academic areas.

Teaching behaviors used by instructors in their classrooms have been studied to examine the effectiveness as well as the effect on student evaluations of instruction. Differences in instructional goals and expected student outcomes have been analyzed by department category as well as differences in course specific content. The literature shows, however, that even within university academic disciplines, consensus on exactly what knowledge should be communicated to students within the disciplines or what methods would be most effective for student learning is apparently limited. "The relative lack of agreement within and across disciplines about how knowledge is validated suggests a problem for professors in the classroom" (Donald, 1995, p. 7).

Although Hativa calls for examination of the "increase in our knowledge and understanding of the causes and consequences of disciplinary differences in teaching and learning," the attention to learning differences among and between the disciplines has been minimal. Possible differences in the learning preferences, knowledge processing and acquisition skills, and organizational skills used by learners in various college disciplines have not been examined. "Clearly, few aspects of academia are more compelling and enduring than the disciplines. Perhaps the most important aspect is to continue to subject the disciplines themselves to study" (Hativa, 1995, p. 3).

Do adults in a specific field of study in formal higher education have different patterns, procedures, and goals in their learning the material than other learners in different academic disciplines? What techniques for learning are most effective for each different discipline?

> The issues related to disciplinary differences continue to be vaguely defined and underexplored. Of the literally thousands of studies of teaching, learning, and teacher evaluation in higher education, very few have examined disciplinary differences. (Hativa, 1995, p. 2)

The importance of distinction between disciplines lies in our ability to understand whatever consequences there are of disciplinary difference upon the paradigms of learning, the process of creating new knowledge, the patterns of validating new knowledge, and the culture and environment of content-specific learning. Research that is focused on the college academic discipline can augment the understanding that is currently lacking in much of the work in these areas.

Statement of the Problem

The importance of the content knowledge required in academic disciplines in higher education is endorsed and fiercely defended by the professory across the gamut of academic disciplines in colleges and universities worldwide.

> However, despite their practical and pervasive influence, the disciplines themselves have been subjected to relatively little systematic study, especially in their effect on the quality of teaching and learning in higher education. We need to increase our knowledge and understanding of the causes and consequences of disciplinary differences in teaching and learning. (Hativa, p. 1)

Professors, as the academic leaders in the higher education, carry responsibility for the dual role of organizing, sorting, and evaluating the new knowledge in the content area and also of making the ultimate choice of what new information will be disseminated to the formal educational field via their course content. They are the gatekeepers for and primary resources of the information, both new and old, that is disseminated to the field of learners in the academic disciplines.

> For many reasons, then, the academic profession ought to arouse our curiosity and elicit serious study. It trains the members of an increasing number of leading fields outside the academy; its ideas speak to economy and politics, to social order and culture; and its leading scientists produce knowledge and technique in such world-transforming fields as atomic energy, biotechnology, and computerization. In so many ways, more than before, it touches the lives of the general public. (Clark, 1987, p. 2)

University professors can provide a pivotal perspective on this issue of disciplinary differences inasmuch as teachers are first learners. Although individual preferences for learning styles and learning strategies have been documented (Fellenz, 1993), the concept has not yet been studied from the viewpoint of practicing professors. Little research is available on whether professors in any one content area actually have different learning patterns and strategies or information organization and processing skills than those of their counterparts in other disciplines.

Do scholars of the various academic disciplines use specific learning behaviors that are most effective to master the academic rigor of their particular field of study? Are there processes for learning and organizing information that are more effective for one academic discipline than for another? Do professors within each academic discipline use similar learning strategies to process and organize the knowledge of their content area? Are there differences in the validation of new knowledge among college academic areas? Are the professors aware of their students' approaches to learning?

> To improve instruction and to interpret student ratings appropriately across disciplines, we need to increase our knowledge and understanding of the causes and consequences of disciplinary differences in teaching and learning. We need to know the structure and organization of disciplines, the culture and environment in which teaching takes place, and the differences among faculty and students across disciplines regarding their attitudes toward instruction, their goals, beliefs, values, philosophies, and orientations. University faculty need to know more about good teaching approaches in their particular disciplines, and about the problems and difficulties of their students in learning their particular subject matter. Faculty developers need to understand these issues in order to improve

> instruction in particular domain areas, and administrators need to recognize differences in students' evaluation of their instructors in different disciplines in order to make appropriate decisions. (Hativa 1995, p. 2)

The problem for this research, therefore, was to examine how professors in various college academic disciplines process knowledge and organize information critical to their respective content areas.

Purpose of the Study

The purpose of this study was to describe the way that learning occurs and knowledge is organized and processed by professors in various academic disciplines. The study focused on university professors in four distinctly different academic content areas to examine the preferred approaches to learning within and between disciplines. In depth personal interviews were done to gain insight into the strategies for learning and organizing material relevant to the specific field of study of each professor and an analysis was performed on the narrative data collected.

"The best way to help teachers of adults increase their effectiveness is to emphasize learning — theirs and the participants" (Knox, 1980, p. 73). Through a deeper understanding of the learning preferences and strategies of the college teachers, a clearer understanding of better methods to support successful strategies for individual student learning, to improve content area teaching techniques, to prepare teachers for successful practice in different

disciplines, and to adopt more informed approaches to management and administration is achievable.

Research Questions

This study used the following research questions for inquiry:

1. What learning strategies and techniques do professors in different college disciplines utilize to process knowledge and content specific information?
2. How is new knowledge created in the academic disciplines?
3. How is the required body of academic knowledge validated by the professors in the discipline?
4. Do professors of college disciplines recognize learning strategies used by their students?

Significance of the Study

> The study of education, particularly in adulthood (a far longer sequence of learning stages than that which occurs during youth) must ultimately rest upon the desire to discover and use new and better means of learning. (Houle, 1984, p. 232)

The information from this study can provide beneficial insight into understanding learning for all participants in the education environment. If specific learning techniques can be associated with improved academic achievement in a particular college discipline, the consequences could be important to student learning and the efforts to support individualized

strategies, to conscientious practice of classroom teaching, to training more successful teachers for each discipline, and to more effective educational leadership. Awareness and identification of more effective techniques for learning and application of the content material of any academic discipline could have profound results in the success experienced in the educational process. The implications of increased knowledge about the academic disciplines will continue to be important to "both higher education in its own right and in its relationship to secondary education" (Hativa, 1995, p. 3). Those directly influenced by better understanding include researchers, faculty, interns, and teaching assistants in colleges and universities, personnel in student in learning centers and student affairs; and policy makers and administrators of higher education, government agencies and private and public foundations.

This study can provide the groundwork for further study of academic disciplines including the effects on interdisciplinary student and teacher learning processes, teachers trained in one discipline and practicing in another, and design of teacher education training curriculum. Another application of research on academic disciplines could be in the relation of the global focus in learning and teaching to the individual classroom. There could be a valid exchange of knowledge between and among the disciplines on different levels.

> What could be discovered, say, about the physics community as an international phenomenon at the macro level, might well have direct relevance to micro level research in a singly physics

> department. Similarly, micro level enquiries into patterns of teaching and learning in, say, modern languages, political science and social work could have a direct bearing on the development of performance indicators or of study skills programmes at the meso level of the institution. Seen in this light, disciplinary-focused research could provide an element of mutual coherence that is currently lacking in much of the work in this field. (Becher, 1994, p. 160)

Definition of Terms

These definitions will be used throughout this study and are common terminology to the field of adult education and learning theory.

Learning Style: The habitual ways we conduct learning activities, such as setting goals, identifying resources, or generating evaluative criteria (Brookfield, 1990, p. 67).

Learning Strategy: Techniques or skills, rather than stable traits, that an individual selects for a specific learning task (Conti & Fellenz, p. 64).

Metacognition: An awareness of our own cognitive processes (thinking and learning activities) or knowing about what we know (Forrest-Pressley, 1985, p. 2).

Metamotivation: Energized learner-directed control of personal learning. The motivation of the individual to learn to distinguish it from factors relating to reasons for participating in educational programs (Fellenz, 1993, p. 10).

Limitations

Gay (1996) defines a limitation as "some aspect of the study that the researcher knows may negatively affect the results or generalizability of the

results but over which he or she probably has no control" (p. 96). There are inherent limitations in this study:

The application of the results of this study is limited by time and geographic location. The participants were selected from the Montana State University faculty at the time of the study, and therefore the results cannot be inferred to a general population of all other similar college academic disciplines.

> Since sampling is purposive and the "sample" size is small (representing, not atypically, a single case), no attempt is made to generalize findings to a larger population. The issue of generalizability is left up to consumers of the research and to other researchers. In other words, persons reading the report may believe that findings have a degree of applicability for their environment, and other researchers may conduct studies which support the credibility of the reported possibilities. (Gay, p. 229)

" In qualitative research, for example, the researcher herself or himself is usually the only instrument!" (Gay, p. 213). This qualitative study was dependent on the quality of interview and interpretative skills of the researcher.

> The validity and reliability of qualitative data depend to a great extent on the methodological skill, sensitivity, and integrity of the researcher. Systematic and rigorous observation involves far more than just being present and looking around. Skillful interviewing involves much more than just asking questions. (Patton, 1990, p. 11)

CHAPTER 2

BACKGROUND AND REVIEW OF RELATED LITERATURE

Background on Adult Learning

Seventy years ago, in 1926, Eduard C. Linderman published *The Meaning of Adult Education* that strongly influenced the foundational theory on adult learning. The emphasis on learner and situation rather than teacher and subject was stressed in his work.

> The approach to adult education will be via the route of situations, not subjects. Our academic system has grown in reverse order: subjects and teachers constitute the starting-point, students are secondary. In conventional education the student is required to adjust himself to an established curriculum; in adult education the curriculum is built around the student's needs and interests. Every adult person finds himself in specific situations with respect to his work, his recreation, his family-life, his community-life, etcetera — situations which call for adjustments. Adult education begins at this point. Subject matter is brought into the situation, is put to work, when needed. Texts and teachers play a new and secondary role in this type of education; they must give way to the primary importance of the learners.
>
> Authoritative teaching, examinations which preclude original thinking, rigid pedagogical formulae — these have no place in adult education. Small groups of aspiring adults who desire to keep their minds fresh and vigorous; who begin to learn by confronting pertinent situations; who dig down into the reservoirs of their experience before resorting to texts and secondary facts; who are led in the discussion by teachers who are also searchers

> after wisdom and not oracles: this constitutes the setting for adult education, the modern quest for life's meaning. (Lindeman, 1926, p. 10)

Educational leaders also began to recognize that quality adult learning encompasses more than the traditional twelve year requirement dictated by the public school system, and the lifelong element of adult learning was introduced. Issues of measurement of adult intelligence, cognitive development, and the effects of advancing age on memory, information processing and problem solving have occupied the work of educational psychologists for most of the past fifty years (Merriam, p. 5, 1993).

> There is gradually emerging, therefore, a conception of education as a lifelong process beginning at birth and ending only with death, a process related to all points to the life experiences of the individual, a process full of meaning and reality to the learner a process in which the student is active participant rather than passive recipient. (Leigh, 1930, p. 123)

By the early 1970s, new contributions to educational research came from the clinical psychology field to aid understanding of the problems adults encounter when learning. Among the most prominent advocates of this new holistic approach are Carl Rogers and Abraham Maslow.

> We can choose to use the behavioral sciences in ways which will free rather than control; which will bring about constructive variability, not conformity; which will develop creativity, not contentment; which will facilitate each person in his self-directed process of becoming; which will aid individuals, groups, and even the concept of science to become self-transcending in freshly adaptive ways of meeting life and its problems. (Rogers, 1969, p. 288)

> Growth takes place when the next step forward is subjectively more delightful, more joyous, more intrinsically satisfying than the previous gratification with which we have become familiar and

> even bored; that the only way we can ever know that it is right for us is that it feels better subjectively than any alternative. The new experience validates itself rather than by any outside criterion (Maslow, 1972, p. 43)

Although the term "andragogy" appears in German discourse as early as 1833 and was widely used in Europe in the early decades of this century, it was the early 1960's when Malcolm Knowles introduced it into the literature of this country. He defined the theory as "the art and science of helping adults learn" (1980, p. 43). This more comprehensive concept began the development of a learning theory unique to adults that differentiated from previously used pedagogical learning and teaching practices designed for children. The assumptions fundamental to the andragogical theory of Knowles include the following:

1. Adults are self-directed in their learning endeavors. Teachers become facilitators to their learning process.

2. Adult life experiences are rich resources on which they base their learning.

3. The developmental phases adults encounter in their maturation process dictate their readiness to learn what they need to know to successfully cope with their lives.

4. Adults approach learning with a need for immediate application to the problems they encounter (Knowles, 1980, p. 51).

In his later writing, Knowles blends the learning phases of life on a continuum characterized by maturity rather than age alone.

> I now regard the pedagogical and andragogical models as parallel, not antithetical. I speculate that as an individual matures, his need and capacity to be self-directing, to utilize his experience in learning, to identify his own readiness to learn, and

> to organize his learning around life problems, increases steadily from infancy to pre-adolescence, and then increases rapidly during adolescence. (Knowles, 1973, p. 54)

Our understanding of the multiplicity of adult learning encompasses the complexity of the population. Merriam describes the advances in the research field:

> We actually know quite a bit about adult learning. We know who is most likely to participate in formal learning activities, why they do, and when and where the learning is likely to take place. We also know something of the informal, often self-initiated and self-planned learning projects that most adults have going on at any particular point in time. Finally, we know a bit about how this learning takes place, that is, the process of acquiring, processing, and utilizing new knowledge. (1993, p. 5)

College Academic Disciplinary Differences

"Observers have long noted that academicians study everything but themselves" (Clark, 1987, p. 2). Although studies of the mechanics of the academic disciplinary culture and how it has shaped the academic profession of teaching are contained in the body of knowledge of higher education literature, little focus has been given to the specific disciplines.

> The academic profession is shaped by many social settings: the discipline or field of study is one of them. The profession takes a different shape in physics than in political science, in biology than in classics, in engineering than in education. Thus we must pursue the disciplines and search for similarities and differences across them. (Clark, 1987, p. 2)

The research that is reported concerning the effects of disciplinary differences on learning is primarily focused on three areas: methods of knowledge validation within the academic discipline, student evaluation of

classroom teaching practices, and the study methods students use in diverse academic areas.

Methods of Knowledge Validation

The critical nature of the validation of content specific knowledge in any academic discipline in higher education is endorsed and fiercely defended by the professory in colleges and universities worldwide.

> Those who work in higher education soon learn the importance of the disciplinary context of almost all academic endeavor; those who try to go beyond that context by doing interdisciplinary studies are probably most aware of the power of the disciplines. (Hativa, p. 3)

However, even within university academic disciplines, consensus on exactly what knowledge should be communicated to students within the disciplines or what methods would be most effective for student learning is apparently limited. "The relative lack of agreement within and across disciplines about how knowledge is validated suggests a problem for professors in the classroom" (Donald, 1995, p. 7).

This reported discrepancy among faculty poses barriers to learning for the students in their respective classrooms.

> Students interpret the learning task as professors describe it. If professors themselves are not clear about how knowledge is validated, it may be well beyond possibility that students will receive adequate instruction in how to test and validate their own knowledge. (Donald, 1995, p. 16).

Donald suggests attention to the communication from faculty to students specifically regarding "clear expectations about what is important to learn, and more specifically, that they are expected to think and to validate their work" (p. 17).

Student Evaluations

There has been some research work done comparing student evaluations of classroom teaching practices in different disciplines. "Academic disciplines appear to be one area in which student ratings of teaching do differ systematically" (Murray & Ranaud, 1995, p. 31). Student evaluations are reported to provide reliable and valid information on instructional quality in higher education. General conclusions drawn from the studies show that student evaluations are consistent with ratings of the same teachers made by colleagues, alumni and trained classroom observers and are significantly correlated with more objective indicators of teaching effectiveness, such as student performance on common final examinations in multiple section courses (Centra, 1993, p. 11).

Murray and Ranaud (1995) conducted a study involving 401 teachers in the arts, social sciences, and natural sciences at the University of Western Ontario. The differences of the mean student ratings of overall teaching

effectiveness were analyzed showing the "mean student ratings were significantly higher for the arts and humanities teachers (3.96) than for social science teachers (3.82), which in turn were significantly higher than for natural science and mathematics teachers (3.69)" (p. 34).

To help determine the factors contributing to the differences in student evaluations, the teachers were observed in their classroom activities and their teaching behaviors recorded for statistical analysis. Although "academic disciplines differ in the frequency with which they exhibit specific classroom teaching behaviors, they do not differ in the correlation of those teaching behaviors with student evaluations of overall teaching effectiveness" (Murray & Ranaud, 1995, p. 37).

This research indicates that across academic disciplines students consider the elements of effective teaching to be similar, and not dependent on the specific course of study. What makes a good teacher, at least by student evaluation, is the same regardless of the academic discipline. One interpretation of the difference in the student ratings is summarized by the authors "it appears that arts and humanities teachers tend to exhibit a wider range of teaching behaviors that contribute positively to student instructional ratings than social science or natural science teachers do" (Murray & Ranaud, 1995, p. 38).

The practical application of this research to both training and professional development for teachers appears to cross discipline lines.

Attention is drawn instead to the awareness and frequency of use of the teaching strategies that students rate to be the most effective in their learning.

> The teachers of arts and humanities subjects were more likely than social science or natural science teachers to use behaviors in the Interaction, Rapport, and Mannerisms categories (for example, addressing individual students by name, encouraging student participation, maintaining eye contact with students), whereas teachers in the social and natural sciences were more likely than arts teachers to show behaviors loading on the Organization and Pacing factors (for example, putting outline of lecture on blackboard, sticking to the point in answering questions); and arts and natural science teachers were more likely than social science teachers to exhibit Disclosure behaviors (for example, stating teaching objectives).
>
> Teachers in different academic disciplines do in fact differ in the frequency with which they exhibit certain specific classroom teaching behaviors, with arts and humanities teachers behaving more frequently in ways that foster student participation, and natural science and social science teachers more frequently showing behaviors that facilitate structuring or organization of the subject matter. (p. 36)

Another study of student evaluations done by Gillmore reported a positive correlation between student evaluations of classroom teaching practice and how valuable they considered their preparation time for the related class. The more highly the students valued the time they spent in preparation for the class, the higher the evaluation of the classroom teaching performance.

> The time-valued ratio does a much better job of explaining variation in overall ratings than the other, more traditional variables used in the study (for example, class size, course level, required versus elective course status, student and instructor gender, and instructor rank). (Franklin & Theal, 1995, p. 42)

Although these findings are considered by the researchers involved as preliminary, important questions are raised concerning the most efficient methods for teachers to use to make the course content more meaningful in the learning paradigm of the students.

Student Study Methods

The other area of interest addressed in the available literature examines the study methods used by students of various academic disciplines. Entwistle and Tait (1995) report on British studies showing higher student preference for "learning environments" or teaching strategies (lectures, small group discussions, etc.) that allow them to use their preferred study strategies (p. 100). The research reviewed concentrates on describing the level of understanding perceived by the student as essential for satisfactory achievement in their courses. "Students in different disciplines develop characteristic ways of learning based on their perceptions of what is required in their academic work" (p. 93). These findings suggest that whether the students strive for "surface" or "deep" understanding of the course materials is dependent upon their perception of the demands of the curriculum and the expectations of the instructor.

Again, communication between student and teacher is a point of attention drawn from these studies. "A clear implication for effective teaching is that all aspects of a course must convey the same message to students regarding what will be rewarded through assignments and examinations"

(Entwistle & Tait, 1995, p. 101). The higher the congruency of all the components within the curriculum design of each department the more connected the department wide "message" will be and the stronger the support for the students' learning environment.

Entwistle and Tait (1995) make an additional observation concerning student learning. "Students need to acquire more than just discipline-specific knowledge when studying a course in higher education; they also need to develop relevant study skills" (p. 102). Reference is made to one method used in Edinburgh to get information on effective study strategies to the students by using computer software designed specifically to address each discipline. The electronic contents consisted of materials from research as well as interviews with instructors and other students in the field of study.

Adult Learning Strategies

A growing body of research indicates that individuals have preferences in learning styles and use specific learning strategies or techniques in their individual learning process. Fellenz (1993) states, "Adeptness and insight in the use of learning strategies appears to be a significant part of one's ability to learn how to learn" (p. 2).

While "learning styles are cognitive, affective and physiological traits that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment" (Keefe, 1982, p. 44), learning strategies are the techniques or skills that an individual elects to use in order

to accomplish a specific learning task.. Learning strategies differ from learning style in that they are techniques rather than stable traits and they are selected for a specific task. Such strategies vary by individual and by learning objective. Often they are so customary to learners that they are given little thought; at other times much thought is given before a learning strategy is selected for a specific learning task (Conti & Fellenz, 1992, p. 63).

> Rather than skills in note taking outlining and test passing, learning strategies tend to focus on solving real problems involving metacognitive, memory, metamotivation, resource management, and critical thinking strategies. (p. 65)

Metacognition

McKeachie (1994) describes the construct of metacognition as "thinking about thinking, or knowing about knowing. It includes knowledge about ourselves as learners, knowledge about academic tasks, and knowledge about strategies to use in order to accomplish academic tasks" (p. 360). This concept of cognitive psychology originated in the 1970's by Flavell and later was used by his contemporaries Brown and Yussen in their work in model development to aid the study of learning tactics.

To elaborate, Flavell (1976) defined metacognition:

> Metacognition refers to one's knowledge concerning one's own cognitive processes and products or anything related to them, e.g., the learning-relevant properties of information or data. For example, I am engaging in metacognition (metamemory, metalearning, metaattention, metalanguage, or whatever) if I notice that I am having more trouble learning A than B; if it strikes me that I should double check C before accepting it as fact; if it occurs to me that I had better scrutinize each and every alternative in any multiple-choice type task situation before

> deciding which is the best one; if I sense that I had better make note of D because I may forget it. Metacognition refers among other things, to the active monitoring and consequent regulation and orchestration of these processes in relation to the cognitive objects or data on which they bear, usually in the service of some concrete goal or objective. (Cited in Gordon, 1985, p. 2)

Metacognition, therefore is more than personal awareness of one's cognition, but also includes calculated and conscious control over these processes. Conti and Fellenz (1992) state "It has become evident that the learner who is conscious of his or her learning processes exercises control over these process and becomes a more effective learner" (p. 62).

Metacognition theory has been separated into the three interactive components of planning the learning, monitoring the learning process, and adjusting the learning process (Yussen, 1985). Conti and Fellenz (1992, p. 63) defines each: Planning is an analytical activity to find the best way to proceed with the specific learning, monitoring assesses the progress through the learning, and adjusting involves evaluation of the learning with modifications to assure satisfaction.

Long (1990, p. 89) outlines the four distinct segments which must be included in a learner managed learning model for adults. They are self-assessment, goal setting, action plans, and assessment of progress. Many similarities are noted between the components of metacognition and these segments. Although the terminology may vary, the description of the construct can be compared to metacognition.

> Learning how to learn delivers the most rewards after the fact. After gaining knowledge about how learning occurs, acquiring

> awareness of one's learning style, and learning the skills to improve ones learning efficiency, subsequent learning will be enhanced through the learner's active seeking and asking. (Stouch, 1993, p. 59)

Memory

"Human memory and learning are inextricably linked. Without learning there is nothing to remember, and without memory, there is no evidence of learning" (Huber, 1993, p.35). Processing and organizing information is a kind of learning in itself, but retaining and retrieving that information involves memory functions.

> Remembering is central to learning because we learn with our old interpretations. Any new or revised interpretation also must be remembered for subsequent use in making extrapolations, analyses, syntheses, generalizations, or judgements. (Mezirow, 1991, p. 12)

Memory processes are dual mental activities first to store information and then later to retrieve that information for use. These processes involve encoding (acquisition), storage (retention), and retrieval (recall). Huber (1995, p. 35) reports on a predominant memory model proposed by Atkinson and Shiffrin in 1968. This model compartmentalizes memory into sensory memory (lasting less than a second), short-term memory (five to thirty seconds), and long-term memory (limitless time).

Short-term memory is limited by both time and capacity. "It is used to keep information temporarily in mind in order to act on it" (Davis, 1993, p. 159). An excellent example of short-term memory use is looking up a telephone number to make a call or taking mental note of a meeting time and place to

record on a calendar. G. A. Miller's work entitled "The Magical Number Seven, Plus or Minus Two: Some Limits on our Capacity for Processing Information" establishes that most people effectively remember between five and nine bits of information in short-term memory (cited in Davis, p. 161). Short-term memory, then, holds information (textual, auditory, imagery, etc.) for a few seconds until the data is either discarded or committed to long-term memory.

One of the complexities of human learning is in the understanding and description of long-term memory processes of encoding, storage, and retrieval. Seamon's work (1980) describes encoding as the process by which we receive information, and interpret the meaning; storage as the proper filing of the information for later use; and retrieval as recalling it for purpose.

McKeachie reports (1994, p. 284) that in contrast to the traditional psychological paradigm of stimulus-response associations to activate memory connections, more recent theory identifies multiple memory functions, analogous to an information processing system. "It is a system involving nerve cells in activity — activities having to do with learning and retrieving meaningful relationships. Learning and remembering are active processes."

Fellenz (1992, p. 19) again separates this construct into three categories concerned with adult real-life learning: rehearsal, organization of memory strategies, external aids, and application of memory. Repetition of data has proven effective for both short-term and long term memory. Organizational strategies include the patterns used to order or reorder the

original information to expedite retrieval. External aids refers to interaction with elements of the environment to assist recall.

Metamotivation

> If all the air were suddenly sucked out of the room you're in right now, what would happen to your interest in this book? You wouldn't care about the book; you wouldn't care about anything except getting air. Survival would be your only motivation.
>
> But now that you have air, it doesn't motivate you. This is one of the greatest insights in the field of human motivation: *Satisfied needs do not motivate*. It's only the unsatisfied need that motivates. Next to physical survival, the greatest need of a human being is psychological survival — to be understood, to be affirmed, to be validated, to be appreciated. This need for psychological air impacts every area of life. (Covey, 1989, p. 241)

Long (1990) believes that issues relating to personal motivation are pivotal to any study of learning and makes reference to established learning theory.

> We must change the paradigm to one in which we consider creating an environment in which people can apply their motivation rather than one in which we motivate people. It may even be, when we re-phrase the question, that out emphasis may change from promoting education to that of promoting learning!
>
> What the education process ought to be about is creating an environment in which people channel their motivational drives towards the goal of learning. This is consistent with Knowles' affirmation that "the point at which a person takes responsibility for their own growth and development is the point at which they become psychologically an adult." It is consistent also with the emphasis that Maslow makes that the healthy person is motivated by growth motivation towards self-actualisation rather than by deficiency motivation such as is deal with by appealing to the safety/security needs of rewards and punishments. (p. 77)

Metamotivation is used to describe the individual control of motivational strategies that give "energy and direction to personal learning" (Conti & Fellenz, 1992, p. 68). The label metamotivation specifies the motivation of the individual to learn and is distinguished from the reasons adults participate in educational programs. (Fellenz, 1993, p. 10)

Fellenz (1993, pp. 10-11) assigns three categories for use in analysis of metamotivational learning strategies: attention to the learning, reward or enjoyment of learning, and confidence in learning. Attention to the learning refers to the individual's focus of learning abilities on the material. Reward or enjoyment of learning involves the value the learner places on the learning process and the satisfaction or fun of learning that is consequent of the process. Confidence in one's ability to learn is recognized as important to motivation.

Managing Learning Resources

The individual ability of the learner to "gather information, check the accuracy and relevance of knowledge and apply such data to action have a significant impact on learning" according to Conti and Fellenz. (1992, p. 67) The issue, however, is not simply how adults use libraries and computers. "Any analysis of the use made of learning resources must take into account the specificity of the learning process both as regards the individual's learning style and the particular learning task" (Fellenz, 1993, p. 26).

The three elements of this strategy used by adults are identifying resources, critical use of the resources, and use of human resources. Available resources might include any printed material, people, professionals, agencies, and all computer technology sources (Fellenz, 1993, p. 27).

The identification of appropriate resources is critically tied to the rapid changes in our information process. Many adult learners may find it difficult to adapt to the use of electronic data sources and other modern information access techniques. In 1984 Shadden and Raiford confirmed that the older population is not well prepared to deal with communication changes (Cited in Fellenz, 1993, p. 26).

Critical Thinking

"Decision making, problem solving, logic, rational thinking, or, as it is more likely to be called, critical thinking," (Fellenz, 1993, p. 21) has been a topic that has captured intense interest in recent educational research. Brookfield (1990), establishes the rationale for the construct of critical thinking development:

> Helping learners acquire a critically alert cast of mind — one that is skeptical of claims to final truths or ultimate solutions to problems, is open to alternatives, and acknowledges the contextuality of knowledge — is the quintessential educational process. (p. 21)

As one psychology professor noted, "it is the arguments or inferences in a discipline that must be learned" (Donald, 1995, p. 15).

Critical thinking usually refers to both a conclusion (a product) and the justification for that conclusion (a process). Beyers broadly defines it as "judging the authenticity, worth or accuracy of something, such as a piece of information, a claim or assertion or sources of data" (Davis, 1993, p. 179).

Again Fellenz (1993, p. 24) assigns three categories for this technique of adult learning to include: evaluating the assumptions, generating alternatives, and conditional assumptions. Evaluating the assumptions "invites respondents to examine the accurate or the acceptance uncritically given to an assumption while others prompt them to identify relationships, spot inconsistencies, or question value sets. Generating alternatives involves "hypothesizing within the reality of the situation" and conditional acceptance is "developing a critical perspective toward the simplicity of the ultimate answers and categorical consequences" (p. 25).

Summary

The literature dealing directly with the effects of college academic disciplines on adult learning is very limited. Hativa (1995, p. 1) notes that although the importance of the disciplinary context is recognized by those who work in higher education, perhaps most by those involved in interdisciplinary endeavors, there is a prevailing lack of reported research available. There is work in the literature on college teaching, with perspective focus on cognitive preparation, time spent, and the relationships between teaching behaviors and student evaluations in different disciplines.

Learning strategies used by adults have been documented by several authors in adult education literature. However, the inquiry into the link between those strategies and departmentalized higher education is not evident. It is toward that discovery that this project is focused.

CHAPTER 3

DESIGN OF THE STUDY

Introduction

The purpose of this study was to describe the way that learning occurs and knowledge is organized and processed by professors in various college academic disciplines. This is clearly an inductive problem with a holistic and process oriented focus. This project was designed to develop a better understanding of "how and why people [professors] behave the way they do." (Gay, 1996, p. 211) How do the professors of higher education process and organize the content specific knowledge that is fundamental to their academic discipline? An in depth and comprehensive understanding of the processes and strategies for learning used by professors on the Montana State University campus was the topic of interest of this study.

The design chosen for this inquiry was a naturalistic study using qualitative study methods. According to Guba (1978) qualitative research is "an approach which has considerable promise for social and behavioral inquiry" (p. 1). However, "while the frequency of qualitative studies has increased significantly in education, it is a strategy of inquiry which is by no

means unique to education; it has been used for many years in such diverse areas as anthropology, psychology, and sociology." (Gay, 1996, p. 208)

Qualitative Research Paradigm

The purpose of qualitative inquiry is that of "gaining deep insight into phenomena of interest" and "to promote a greater understanding of not just the way things *are*, but *why*" (Gay, 1996, p. 12). The qualitative research paradigm is based on the understanding that the complexity of human behavior does not satisfactorily lend itself to explanation by numerical description alone. A careful analysis of intense and extensive observation is a more meaningful method to gain a deeper understanding of the subject of study. Ethnography is defined by Webster as the "systematic recording of human cultures." Because of the extensive use in the study of both human and animal cultures, quantitative research is also often referred to as ethnographic or anthropological research (Guba, 1978, p. 213).

> Thus, qualitative researchers are not just concerned with describing the way things are, but also with gaining insights into the 'big picture.' They seek answers to questions related to how things got to be the way they are, how people involved *feel* about the way things are, what they *believe*, what *meanings* they attach to various activities, and so forth. (p. 209)

The inductive nature of qualitative research allows an expanding and open working hypothesis to develop, that is subject to constant revision, as the project continues. There is no set of expected outcomes that is identified prior

to the study in qualitative research design. The research questions are general in scope and produce tentative answers with focus on differences as well as similarities between subjects. There are few restrictions built into the study that is more flexible by design (Gay, 1996, p. 219).

Qualitative research is subjective and value laden by the approach to the inquiry. Researchers using this methodology have the freedom to integrate values and beliefs into the research design. "However, the design is not unsystematic or haphazard" (Gay, 1996, p. 219).

> Qualitative researchers argue that there is no such thing as "value-free science" and that the values and beliefs of both the researcher and the phenomena studied are important variables, which, to the degree possible, should be taken into consideration when conducting, reporting, or reviewing research. (p. 210)

The data collected in qualitative studies is narrative rather than numerical, words as opposed to numbers. A descriptive comparison of the qualitative and quantitative study paradigms are included for references (see Appendix A). "Qualitative studies are descriptive; they use a wide variety of data collection and analysis techniques to build a 'thick' description and tend to report results using narrative and quotations rather than numerical data" (Merriam, 1988, p. 10).

The awareness that the environment strongly influences human behavior has prompted the use and acceptance of naturalistic inquiry. If the findings of research are to have meaningful application to real-life situations, the research must be conducted in an authentic setting with as little manipulation of the subjects as is possible. In qualitative research, no control

is maintained over the environment or the subjects. "Sample" refers not only to people, but also to the environment.

> The term "naturalistic" refers to the fact that the variables being investigated are studied *where* they naturally occur, *as* they naturally occur, and not in researcher-controlled environments under researcher-controlled conditions. They [the researchers] want to know how things *are*, in their natural context, and they make every effort to minimize the effect of their presence in the environment of interest. (Gay, 1996, p. 208)

Method of Data Collection

The methods used to collect data in a qualitative study are usually "characterized by some type of overt participant observation and the taking of extensive fieldnotes" (Gay, 1996, p. 222). Extensive, informal interviews with the participants were used as a means of collecting data for this study. The individual interviews lasted from one to one and one half hours and the discussion focused on the interview topics (see Appendix B).

The questions for the interviews were taken from the context of the research questions. The focus of the interviews and the development of the questions was limited to the inquiry into the learning processes of content specific materials for the professors.

> In a qualitative study, the researchers do not want to be restricted by predetermined questions or categories, except in the most general sense. They believe that what should specifically be observed or asked is best assessed as the study progresses, and that there should be few, if any restrictions on the nature of the data collected. Whatever data will shed the most light on the general question of interest are the data that should be collected. (p. 223)

Population Sample

> In a qualitative study the sampling is usually *purposive*, meaning that the sample is selected purposefully, i.e., precisely because it is believed to be a rich source of the data of interest. While qualitative researchers are not necessarily interested in generalizing results, they are concerned with the representativeness of the data they are collecting. In other words, they want their observations to at least accurately reflect the situation under study, regardless of whether the dynamics of that situation are generalized. Ideally, what is observed is not selected on the basis of convenience, but because of judgment on the part of the researcher. (Gay, 1996, p. 214)

The participants chosen for this study were 12 practicing professors on the Montana State University campus; three professors from each discipline of physics, history, music and business management. The disciplines were chosen to represent the breadth of academic study available at a typical college or university. The four fields of study included in this study were a hard science field (physics), a humanities field (history), the arts (music), and an applied science (business management). The categories fit the cluster description of academic disciplines supported by both Anthony Biglan and Lodahl and Gordon (Braxton, 1995, p. 59). The participants were individually and purposively selected. Recognition by members of the professional education academy of the university of both their ability to teach and their interest in learning were used as a critical selection criteria. It was believed, by those members, that these professors were likely to be able to discuss, with meaning and insight, the information examined in this study.

"The qualitative researcher carefully selects a small, not necessarily representative, sample, one likely to yield the desired information" (Gay, 1996, p. 213). These professors were individually chosen from within the education academy with the awareness that they had interests and experiences in learning that would be helpful in the understanding of the relationship between learning strategies and the four academic disciplines under study. The selection criteria for the participants included teaching experience in the discipline with a current teaching assignment in one of the selected college disciplines; peer recognition from within the academy for the educational expertise, insight, and interest in their own learning process as well as that of their students; assumption of the depth and breadth of professional experiences to contribute to the inquiry of this study; and interest in the project.

The professors in this study were all currently teaching courses in their respective departments. They also carried the standard responsibilities in addition to teaching for the profession that are included the continuing research in their area of interest and expertise, writing for professional publication, and the support of graduate student research and educational activities. They all maintain demanding professional schedules that include time scheduled for class preparation, interaction with students, assessment of students' work, continuation of multiple research projects, reflection on personal professional performance, performing administrative duties to the university, responsibilities to the profession, and service to the community.

The range of years of teaching experience was from 6 to 35 years, with a mean of 18.25 years and a median of 15.5. Of the twelve participants, seven were male and five female, representing stronger gender equity than is characterized among the current faculty at Montana State University. Although gender was not a controlled variable in this study, within each discipline at least one woman was interviewed to integrate gender perspective into the findings. With the exception of one participant, all of the professors had earned doctorate degrees.

Table 2 describes the demographic information for the participating professors.

Table 1. Profile of Participants in the Sample.

Department	No. of Participants	Gender	Years of Teaching Experience
Physics	3	2 males 1 female	6 24 30
History	3	2 males 1 female	8 17 25
Music	3	2 males 1 female	10 14 35
Business Management	3	1 male 2 females	13 14 23

Each professor was sent a letter of invitation to participate in the study (see Appendix C). The framework of the inquiry was outlined, the purposes

explained, and an agenda of the interview topics enclosed (See appendix B). Personal phone calls were made to confirm interest and availability of the professors and to arrange appointments for the interviews. The interviews were conducted in the offices of the participants and lasted one to one and one-half hours. The discussions were in depth, probing the substance of the research questions through the personal contribution and insight of the individual participants.

Data Compilation Methods

Although copious notes were handwritten during the interviews, each one was recorded on audio tape to help ensure the content accuracy of the individual responses. Using a computer database software application package, the tape recordings were transcribed into written narrative that would eventually be reported as findings of this study.

Analysis was done on the written interview documentation and emergent categories were developed for each participant's response. Labels were attached to each piece of pertinent information, identifying both respondent and category of classification for the information. The information was then compiled into one data file and sorted by category and respondent's name, resulting in 116 pages of written text.

Data Analysis Methods

Compiling the narrative data from the interviews provided meaningful structure for the description of the learning strategies used the college professors. The analysis of the findings of this study concentrated on the differences among and between the college disciplines in the learning strategies most effective for each separate discipline.

The application of the conclusions of this study has limitations of both time and geographic location. The participants were selected from the Montana State University faculty to give better understanding to the issue of the impact and importance on learning that disciplinary differences might have. The results cannot be automatically inferred to a general population of other colleges or universities.

> Since the sample is purposive and the "sample" size is small (representing, not atypically a single case), no attempt is made to generalize findings to a larger population. The issue of generalizability is left up to consumers of the research and to other researchers. In other words, persons reading the report may believe that findings have a degree of applicability for their environment, and other researchers may conduct studies which support the credibility of the reported possibilities. (Gay, 1996, p. 229)

The participation of the researcher in qualitative research is vital to the research design and often is very closely involved with the subjects. "In qualitative research, the researcher herself or himself is usually the only instrument!" (Gay, 1996, p. 213) Therefore, the validity of the data collected is dependent upon the integrity and ability of the researcher. "In qualitative

study, we can say that the 'goodness' of the data depends on the 'goodness' of the researcher." (p. 213) The ideal of good qualitative research is to report observations that accurately reflect what actually was observed , allowing the "completion of the mosaic" (p. 211) as the data collection progresses, and it is in that intention that the findings of this study are reported.

CHAPTER 4

FINDINGS

Overview

The strategies used by college professors to process knowledge and organize information provides insight into characteristics of learning behavior that can have importance and impact on the various academic disciplines. The professors in colleges and universities hold the authority and responsibility of the academic rigor of their fields of study by the validation of the information and critical analysis of the course content. They execute the role of gatekeeper and primary disseminator of content specific information to the formal education field. One primary creation source of new knowledge is through the research efforts either directly of the members of the college professory or the projects they supervise and/or advise.

However, teachers are first learners. Perhaps it can be argued that the learning behavior of this group approaches pure learning, learning for the sake of learning, more often than for other segments of our society. "Getting paid for reading and learning" and "my job is to do one of the most enjoyable things of my life, studying and learning" are comments of the participants. Their posture within the university structure encourages them to value new learning,

consciously foster an awareness of the learning process of both themselves and their students, and constantly rekindles their curiosity with the fascination of new knowledge in their field.

What effect do the demands of the academic discipline have on learning for scholars? Are there strategies for learning the material of a specific field of study that are more effective than other strategies? How do practicing professors approach new learning and how do they validate new knowledge within the discipline? The research process for this study involved personal in depth interviews with professors from four college academic disciplines; physics, history, music, and business management, to gain a deeper understanding into their strategies for learning and organizing and processing knowledge.

Demographics of the Sample

The narrative data for this study was gathered from twelve practicing professors on the Montana State University campus, three from each discipline of physics, history, music, and business management. The sample was purposive, the professors were individually chosen because they were believed to be a rich source of the information needed for this study. The participants were purposively chosen based on the selection criteria of teaching experience in the field with a current teaching assignment in one of the selected disciplines; peer recognition from within the academy for their expertise, insight, and interest in their own learning process as well as that of their students; assumption of the depth and breadth of professional experiences to contribute to the inquiry of this study; and interest in the project.

Demographic homogeneity of the sample was evident in their current teaching responsibility, intensity of their energetic individual professional

agendas, and the absolute enthusiasm and passion they had for their work. Demographic diversity of the sample was evident in academic discipline, age, gender, and teaching experience.

The professors in this study were all currently involved in teaching classes in their respective departments, and many of them also carried the responsibility of their own continuing research and the support of graduate student educational activities. They all maintained demanding professional calendars including time scheduled for class preparation, interaction with students, assessment of students' work, continuation of multiple research projects, reflection on personal professional performance, administrative duties to the university, responsibilities to the profession, and service to the community.

The statement of one history participant echoed with impressive repetition from interview to interview, "I think what really makes history [education] work in the classroom is that we [professors] have to bring absolute passion to the subject." A music professor made a similar observation, "The teacher who gets in a rut is a teacher who stops perceiving the mystery of his subject matter. They have stopped looking for the secrets." The personal dynamics and professional enthusiasm evident with all of the participants were compelling to the researcher. "It's fun, challenging, and satisfying" stated a physics professor. "I enjoy coming to work, actually" remarked an historian. "It's an avocation" said a music professor.

The range of years of teaching experience was from 6 to 35 years, with a mean of 18.25 years and a median of 15.5 years. Of the twelve participants, seven were male and five female, representing stronger gender equity than is characterized among the current faculty at Montana State University. Within each discipline at least one woman was interviewed to integrate gender perspective into the findings of this study. With the exception of one participant, all of the professors have earned doctorate degrees.

Description of the Disciplines

The four disciplines examined in this study were physics, a hard science field; history, representing the humanities field; music, the study of arts; and business management, an applied science. These disciplines were chosen for their diversity and representation of the typical college academic fields of study. The characteristics of contrast described by the participants form a foundational understanding of separateness of the disciplines. The perspective of time and influence of the content materials is unique for each one.

Physicists spoke with precision of mathematical models and problem solving. The definitive quality and replicable nature of their knowledge base and the curiosity generated by the unknown answer to a problem seemed to drive these physicists.

> It comes down to one basic principle and if you truly understand that, there is a wide range of choices you can then compute from that. (Physics professor)

> There are major problems in physics that have intellectual significance for us, and probably practical and economic significance, that people are working on all the time. To give you an example, I think of superconductivity. It's been recognized at very low temperatures for many decades. However, only ten years ago or so, we discovered that we can have superconductors at what people in the field think of as high temperatures (liquid nitrogen). That is cold by our standards, but easily accessible in the lab. It doesn't take a tremendous apparatus to reach those kinds of temperatures. That has big significance. We don't understand why that superconductivity appears. Electrical currents flow without resistance. It means that you can transmit electrical power at much lower cost, for example. It is important for computers and machinery. We do not know why that phenomenon occurs. We can generate it in the laboratory, but we don't understand it. It's easy to identify, lots of people working on it, but it resists solution. (Physics professor)

> Just the existence of a phenomenon which nobody understands is sufficient reason to continue the work. Even if the problem didn't have practical significance, physicists would be interested for that reason. (Physics professor)

Historians related the importance of new and personal interpretations and insights into the events of the past. The facts of past occurrences that many of us think of as history are only the raw data for an historian. History is the interpretation of the informed and very personalized analysis that forms an historian's perspective.

> It's a very personal process, that historians are bringing everything they know, everything they understand, all the values that they possess, their own prejudices and their own ideals to that study. New generations, having new experiences, simply bring a whole new set of those experiences to the process. It is ongoing. It never really ends. There is no normative history, that once is done never has to be done again. (History professor)

> The nature of history is such that every generation has to write its own history. Essentially, what people, I think, misunderstand about history is they presume history is the past. Now the past is

> simply the raw material for history, history is what historians produce. So when you pick up a book that an historian has written, that's history. The past is simply the events that the historian draws upon. (History professor)

> It is the historians own theoretical categories, what interests him/her theoretically, that dictates the questions they're going to ask of the sources. You could give ten different historians the same pile of sources about a strike, and you'll get ten different stories, depending on their individual interests. Contractual obligations, gender, ethnicity, etc. would catch some people's interest, but not others. (History professor)

Music educators talked about the educational contribution of personal esthetic experiences that give meaningful to the study of the discipline. It is an experience that can expand the educational as well as life experiences of learner who immerses himself or herself in the study. Creativity is fundamental to this study, but it is tempered by the rigor of self-discipline and continual aspirations for personal improvement.

> Music education can make a difference. I think it takes a certain kind of person to be holistic, to be open. They have been introduced to a way of life that broadens their outlook as opposed to people who close their ideas and are quite content with the life they are living without this expansiveness. Education is more than what people try to make it to be. There are subtle forces at work in our lives, and that is what art is. (Music professor)

> Esthetics, creativity, and appreciation, I think, is very important for anyone who is teaching and learning in the arts. (Music professor)

> To my way of thinking, even though I want it to be good, it's not just good enough to be good if the students have just sung notes. There's something else there that has value, intrinsic esthetic value, that the composer is trying to say. (Music professor)

Business management instructors spoke of the breadth and diversity in the field. The discipline and profession seem to demand the mastery of many broad and sometimes debatable theories. The challenges of business management professionals are as multifaceted as the businesses they serve. The focus for the field is utilitarian practical application to a business structure. The meaning of the study is in the operational function of the model or theory.

> Business is a very diverse study. As you go from one industry to another, the demands and pace of operation, the language, and the kinds of financing needed and where you get it from is all very different. As a result, you get things that work in some places and don't in others. It makes it much harder to prepare professionals, but the career itself is more challenging and exciting. (Business management professor)

> In terms of newness, management is a field somewhat like medicine 150 or 200 years ago, in that people really don't know what's going on. Our theories are not very powerful theories, and so there is almost a series of quasi religious movements that occur, not unlike education, frankly. There have been a whole series of them that have made individuals a great amount of money, but as one follows the logic and tries to implement them, you find that they are not as powerful as they might have been. In the whole behavioral management focus, Management by Objectives, TQM [Total Quality Management], each one has a little bit of truth and a whole lot of snake oil. As people try to apply these, particularly if they are charismatic leaders, it doesn't matter what they try to do, they would succeed. People try to replicate it who are not charismatic leaders or in organizations where the challenges are much greater, and it doesn't work. There's that pendulum, though, and each time someone comes up with yet another little piece of the puzzle. (Business management professor)

Patterns begin to emerge in the descriptive narrative. Factors of measurability, interpretation, and application shape the distinctive foundation for these academic disciplines. Physicists are looking for one answer in their

learning, while musicians search for esthetic meaning. The business management field needs answers that work when put to the test of a practicing business. Historians use the facts recorded or reported from past events to integrate with their knowledge and personal experience to give meaning to their learning. The review of the findings from the interviews demonstrates the continual development of these patterns.

Results of the Interviews

The questions for the interviews were devised from the research questions written for this study. For clarification of analysis, the narrative will be addressed in four categories: Learning strategies and knowledge organization techniques used by the participants, methods used in the field for the creation of new knowledge, methods used in the field for the validation of knowledge, and the participants' awareness of learning preferences of the students in their classrooms.

Learning Strategies and Knowledge Organization Techniques

This category is multifaceted yet fundamental to the entire study. Questions of the participants' individual strategies for learning new content specific material, changes in learning behavior patterns, uses of memory, and the motivation to maintain professional interest were addressed.

Participants' Strategies for New Learning

> Is there is difference between the disciplines in the way learning takes place? The obvious answer is yes. There are differences even within the field of music. The way people learn music history is a lot different than the way they learn to play the clarinet. There should be more commonalities between teaching history of music and teaching history than there are between teaching history of music and teaching someone how to play the clarinet. (Music professor)

Across discipline boundaries, the professors responded to the question of how they approach a new learning situation to organize the learning process by initially relating the problem to their existing body of professional knowledge. "That's really what this whole process is about. It's new to you, but how does it relate to what you already know?" (Business management professor). "I basically start with what I know" (Music professor). Their previous experience and professional expertise in their fields made the separation of totally new learning from its relationship to the participants' prior knowledge an irrelevant method of analysis. Current knowledge base and new learning seemed to be so inextricably tied together that, "I'm not sure I can separate them at this point" (History professor).

The questions on strategies for an approach to new learning were confined to the learning of content specific material. The focus for this query was on metacognition, the participants discussion of how they "think about their thinking and knowing processes" (Fellenz, 1993). How do the participants organize the learning of new material to teach a new course, consider new research content and design, or perform a new piece of music?

Participants from the physics field reported a systematic, decisive approach to new learning. They are problem solvers and model builders. A problem surfaces and they design lab experiments or computer models in search of "the" answer. Although one physics participant is a theorist (calculations, computer simulations, modeling) and the other two are experimentalists (laboratory research), their approaches do not differ significantly.

> Break the problem down. Simplify it. Make a model or an approximation of the problem that you are trying to solve. After you do that, you go back to the beginning and add some more complexity and do it over again. This is a pretty standard approach for physicists. (Physics professor)

> In research, the first thing I would do is look for a very good paper written by somebody else that is comprehensive, not skipping steps. If there are some derivations in there, I want to go through and repeat all those derivations for myself. I want a good paper that will guide me though that process. In Amsterdam, I think about a time that I learned about a new way to do some calculations of some simulations of what happens on the surface [with metals]. I found a paper written by someone who had developed this process and just went through and really tried to understand every equation and worked my way through it. The way I learn best is by doing problems, in that sense reading a paper and working through the process is a problem set. (Physics professor)

> As an experimentalist, you start out with some ideas that you think might prove or disprove something, or further your understanding of some process. You design and create the experiments directed toward that goal. (Physics professor)

History professors emphasized the mastery of literary resources as the initial step to organizing new learning. Personal interpretation of the analysis of the primary and secondary sources is foundational to their study. They build

a chronological bibliography, organize what is already known about the problem, research to fill in the gaps of information missing in the time line, and begin their personal analysis. They spoke of the subjective nature of the writing of history and of the professional obligation to maintain the authenticity and original intent of the primary sources of their literature.

> Historians do not go into an investigation with a "working hypotheses." Basically, the method of historians is to look at the primary sources to decipher and create the story based upon those sources. All of us are subjective, and every good historian recognizes that history is subjective. We know that, of course, our own predilections and political views and theories about race and gender and class and politics are going to shape the way we read documents and the way that we analyze. But, the intention is to try to be self-conscious of those subjectivities, and at the same time try to read the sources as truthfully as you can to the intention or motive of the people who created it. (History professor)

> The approach I would take is the way you do every project in history, you start by building a bibliography. I'd divide it out by time frame. History essentially takes place in time and in space. The way you confine a study is in those terms. By time; all of world history for a period of time, or the history of Germany over all time. Then all of the experiences in that time, or one particular set of experiences. I would build those constraints of time and space. Then I begin to build a bibliography in a classic chronological order to get a command of the literature that exists. (History professor)

Learning a new piece of music was an experience common to all of the music professors. They approach the study of a piece of new music in search of style and a sense of "where it is going." They spoke of hearing music when looking at the notes written on a musical staff on paper and of repetitive arduous practice of the music.

> I study the notes, get the technique, and think about the style and the overall esthetics. (Music professor)
>
> I read music very easily. I can read most music right away. If I am going to perform a piece of music, I must play it every day for a year. I wouldn't feel comfortable in public without practicing it every day for a year. Repetition is how I learn the music. (Music professor)
>
> A new piece of music, I would rather study it first, before hearing a recording of it. I might play it on the piano, or just sit and study the harmony, the form, and analyze it without hearing it. I can't hear every piece of music I look at, but I can tell where it's going. I can identify rhythm, melody, harmony, dynamics and then when I hear it, it jumps out at me. (Music professor)
>
> It would be much easier if I heard it first. It's analogous to seeing a movie before reading a book. (Music professor)
>
> When I look at a piece of music I can hear it. It's a very highly regarded skill to look at a piece of music, before you've ever tried it, and be able to hear it. (Music professor)
>
> In very exciting, very exciting, moments a piece of music will come alive, and you get the same thrill from looking at it and hearing it in your imagination as you do hearing it in person. (Music professor)
>
> Yes, I can hear music from a written score. Let me clarify that statement a little bit. If it is a full symphony score, it would be much more difficult. However, if it is a solo piece for the clarinet, I would be able to sing it just from looking at the notes. (Music professor)

The techniques of integration and application are fundamental to business management. The professors talked of experiential learning and utilitarian application of pedagogical theories. They take professional license with their theories to use the parts of each one that will help solve the problem situation of the study. The knowledge and experience of the learner in relationship to new learning was closely associated for them.

> From where you are now, and what you know, how can you reach out to theory and be more effective in this circumstance? It's looking back, looking at who you are, and then thinking forward. That process is really what we are trying to develop. (Business management professor)

> What I start with typically are pedagogical materials. Step back and just sample what's available in that field, a grounding process of describing the experience from different perspectives, relating it to the theory, and looking at managerial behaviors that would increase effectiveness. (Business management professor)

> I find myself reading the text to find the most important ideas. I tend to outline and take copious notes. I usually find several ideas that catch my attention or that really explain something for me. I use those as major topics. Then I go to find examples to illustrate and elaborate on the ideas. (Business management professor)

> You're not talking about concrete things, you are talking ultimately about value and about judgement. What those students are looking for is the expert to tell them what the right answer is. As the instructor, you say there isn't one, make it up, and it's right if it works. It's very utilitarian — this is business not philosophy. We're looking for things that work. (Business management professor)

Individual and Group Learning. A point of interest developed in discussion of the participants preference for individual versus group learning. Most of the professors reported a preference for an individualized approach to learning that was supported by the professional environments in their respective departments. Their work is primarily done alone, with only occasional group interaction for clarification or interjection of new thought. However, an exception to this generalization surfaced in physics. The group work done in the research laboratories is primary to their professional learning.

The organization of this university system encouraged and indeed rewarded individualized professional accomplishments. Professors were evaluated, tenured, and promoted based on their individual professional achievements. Collaboration appeared to be a valuable issue for their teaching, but not necessarily for their professional practice.

> I learn much better by myself than with groups. (History professor)
>
> When I was a student, I did not like group projects, however now I can see the value in collaboration. But when I go to learn something, I probably would go on my own. (Business management professor)
>
> I think I'm pretty unusual in the field in that I've actually worked on several collaborative projects including a major book. I find it both extremely rewarding and frustrating. Collaboration is not very efficient, and on the other hand every collaborative work that I have done has produced a much richer piece of work than any individual work I've done. (History professor)
>
> A new piece of music, assuming it is written to be performed as a solo, usually I work on alone rather than in collaboration. Members of the MSU faculty are basically all specialists in their individual fields, and the instruments are very different. There really is no mentoring available. I would likely email a colleague at Arizona State, and ask him what he knows about it, if I wanted input from another specialist. (Music professor)
>
> At this stage I prefer to learn alone. It's safer. There is no risk involved if I learn on my own. I can choose what I want to read, what I want to listen to. I can choose my topic. I'm not a very good workshop attendee. I don't get really involved in workshops or inservice training. It's more solo work at this stage of my career. (Music professor)
>
> A piece of new music, however, I would learn on my own. Where the collaborative knowledge might come in would be in the technique, an efficient way to hold the bow or to finger a certain passage, but as for an individual piece, that's mine. (Music professor)

> I learn by myself. I liked large classes when I was in school, because that's where I could be autonomous. In small group I was always in competition with the others. I never liked competition with anyone. I was just in competition with the material in front of me. If I wanted to have a dialogue on that, I would seek out the professor and have it there. I wasn't the least bit interested in sitting around a table listening to everyone else. I knew my ideas were the most important to me, as an undergraduate. Orally parroting the ideas is not interesting or probing. Graduate school was a bit different, very exciting. Most of the students who go to graduate school are usually the best in their class. That was fun. Those were really informed ideas and learning could take place. I was anxious to be a part of it and contribute to it. (History professor)

Although the physics professors also discussed working alone on problem solving or model building, the effective use of group work is functional to the research work done in the physics laboratories. Reference to the collaborative research in the laboratories was the only time that continuous group work with colleagues was identified as an established pattern of learning.

> Certainly a lot of the learning is done by yourself, but physics is a very interactive discipline. Every physicist I know practically, works in groups. It's so true that the exceptions really are obvious. We do not work alone. If I were to tell you what's going on in this department, I would tell you what the research groups are. These are groups of individuals who interact on a daily basis, professors, and students, and research people. (Physics professor)

> Collaboration is a big part of learning and research in physics. (Physics professor)

> Although I don't do experiments, I work with an experimental group. The problems I work on tend to be those that they can also be tested in the laboratory. Predictions that one makes can be compared with data. (Physics theorist professor)

Learning Modalities. In discussion of auditory, visual, or kinesthetic modalities of learning, the predominant reliance upon printed resources for most of the participants gave strong tendencies to visualization. Many of the professors spoke of reading as the dominant learning behavior, showing heavy reliance upon printed materials as resources for their learning. Their expert practice in their field of study and the familiarity with the language that their advanced knowledge stage provided these professors could contribute to the reported comfort with visual symbols.

> I was the only person, I think, who sat down and read the entire manual. It helped me so much. I could just do it and I knew all the ins and outs [of the online database] because I had read the manual. For me, that was a real effective way. (Business management professor)

> I learn better by reading, I'm visual. In fact, when I go to conferences, I often do not get a heck of a lot out of papers. If something sounds interesting, I always ask the author to send me a copy. (History professor)

> For the history class, the preparation was almost all research. The research required to teach it the first time was incredible. There is no textbook. It started with all independent research to design the structure of the class. (Music history professor)

There were, however, some alternative choices that surfaced among the participants. One physicist talked of kinesthetic learning in the lab doing experiments. The musicians talked of the auditory component to their learning music and the training of a "discriminate ear." Two of the history professors commented on the enjoyment they receive from listening to a "really well presented lecture." Some of these professors, however, also spoke of reading to get their information.

> I am a kind of kinesthetic learner. I enjoy doing things with my hands. That's why I'm an experimentalist rather than a theorist. But at school, reading was my primary source of information. (Physics professor)
>
> I am completely focused to learn by ear. It's a discriminate ear because it's been trained to be discriminate, but it can be just as indiscriminate if it doesn't have a purpose. If I hear sound, I'm immediately discriminate. If it's my work, I listen carefully. (Music professor)
>
> I love hearing a really good lecture. If it is a person who has wonderful resource material, an elegant argument, a sense of humor, and a persuasiveness to it, I find it extremely entertaining and very invigorating. (History professor)
>
> I have become increasingly interested in art and visual imagery in the last few years. I don't feel like I really know how to read it yet. I don't know how to ask the kinds of questions of those visual sources that I know how to ask of oral or literate sources. (History professor)

Changes in Learning Behavior Patterns. A point of inquiry for this study was to examine any differences that have occurred in the learning strategies and knowledge organization skills during the time lapse since the participants studied for their undergraduate degrees. The relationship between the two sets of learning behaviors could add insight into the effects of experience, maturation, and focus upon the learning and might have significance for undergraduate learners. The responses were somewhat homogenous across the disciplines in the increased ability of the professors to focus on the content specific material of interest and their efficiency in their development of learning strategies. It appeared as the professors became more deeply involved in their discipline, their global academic focus narrows and their peripheral

attention dissipates. The attention of their scholarship became definitively grounded in their specific discipline.

> Yes, much, much different! I don't think, consciously, I was dealing with it on anywhere near the intellectual level as I do now. An awful lot of it was simply interesting. (History professor)

> One of the big differences is that once you enter graduate school, you become so discipline specific that I'm sure I probably shifted mental gears more easily as an undergraduate. I read history and an occasional mystery. I don't venture out into these other fields. I don't have the foggiest idea what the latest scholarship is in biology. (History professor)

> I might be more inclined, initially, to sit back and think about where have I encountered a problem like that before. Are there some general characteristics I can recognize? Maybe I should think about this a little bit before I run to the library. You bring that body of experience. (Physics professor)

> That's something I did very little of as a student. Taking my answer from a homework problem and taking it to the extreme. What happens if I do this or that to the answer. I recall my teachers telling me to do that, but I don't think I did much of it. I now tell my students to do it. Are they doing it? Maybe not as much as they should be. I don't think its a function of maturity as much as of priorities. There is a lot of work to do and limited time resources. I've got the answer. It's the same as the one in the back of the book. I don't have the time to sit and think about how that answer will change under these conditions. It is not a part of the assignment. I'm not going to take the time. (Physics professor)

> My practice is much more thoughtful and analytical and my concentration is better. (Music professor)

> Now, I'm a little more discriminate about what I want to learn, what I think I need to know, and so I focus in those areas. (Music professor)

> I think I come at it from a broader perspective and see the whole picture better. I can focus in on what I need and how that relates to the larger picture. (Business management professor)

A particularly well-articulated response to the question of changes in learning behavior over a period of time came from an interview with a business management professor. This professor makes a summative statement of the issue.

> I think that most people in the beginning have to build some depth and strength. You do it by focusing and by getting rid of distractions. And then later on, the distractions are where the meaning is. It's the noise at the edge of the theory, and how it fit together, and what isn't working quite right — that's what you pay attention to more. (Business management professor)

Uses of Memory. Huber reported that memory and learning are very closely linked. "Without learning there is nothing to remember, and without memory, there is no evidence of learning" (1993, p.35). The functional role of uses of memory in both the learning process and professional practice of the different disciplines was a topic of discussion in the interviews. How critical was memory for them in their academic work?

There was not agreement among the professors in the physics department about the importance of memory in learning. The importance of memorizing formulas and basic concepts in physics is apparently a matter under consideration by the faculty. The professors indicated a difference of opinion on the issue. Some of them think that is important to memorize at least the basic concepts, for ease in later reference, but others say that the material is readily available and it is easier to look it up when they need the data.

> If I knew the answer to that question I would solve a controversy in the department. The controversy in these introductory courses, for example, is it important to memorize a lot of the basic concepts so that when you go to the next step you don't have to go back and look that up. Some of us say yes and some say no. (Physics professor)

> Eventually those equations are a part of my memory, because I use them so often. I feel it is pretty important to commit some things to memory to be able use them and be more efficient. (Physics professor)

> It is not as important as in some other fields. If you can't remember something, you can usually figure it out. Many people look at physics and think that there are all these formulas that you have to remember, but when you reach more advanced levels you don't have to remember much at all. I would say very little. (Physics professor)

The responses of the history participants did not follow the traditional assumption of the significance that remembering dates and places would hold for an historian. Ironically, it seems, the details of past history were reported to be of little consequence by the history professors. The professors talked about the continuity of the "broad story" and how the particulars of dates and names and places just "slip into the right place" in the scope of the whole story. One history professor related a trick of remembering the date with an event in history by making the date the "first name of the event." "Like It's never just the Cherokee Case, it's the 1831 Cherokee Case. "

> I do not have an extraordinary memory for details. I certainly do use notes to remind myself of the factual things and quotes. It's important, but not overwhelmingly important. (History professor)

> For an historian, I'm embarrassingly bad on dates, and I don't tend to remember details and specifics very well. One of the things I do is have extensive notes. I have an outline of all the

> dates that I need to know, and I need to refresh them every time I do a presentation on that material. (History professor)

> Once you build up the continuity of a broad story, everything sort of slips into the right place. My memory is good. Historians are the best Trivial Pursuit players in the world. Historians have a literary sense about them. As they accumulate information, it becomes part of <u>their</u> story that they are capable of telling. (History professor)

> I'm more interested in how people learn to develop a thesis and construct an argument than to remember certain dates. (History professor)

Music performance requires specific demands on the memory functions of those performing for the public. The music participants utilize very distinctive techniques to prepare and perform a piece of music from memory. One professor talked about his methods of preparation that include being able to write the piece, finger the piece on his clarinet, and sing the piece all from memory. Again the rigor of continuous practice was mentioned in preparation for performance. Memorization of the music is primarily done by rote.

> I memorize by the sound and by my knowledge of the music. I memorize a piece for performance by repetition (Music professor)

> When I go on stage with a memorized piece, I can write it out, finger it on my clarinet, and sing it. So it's not like I just start and my fingers know what to do. I am able to write the melody line of the piece on a musical staff from memory. I can also play it without blowing on the clarinet; for example, I can just finger through it, so that I don't have the musical guide to help me. My fingers are trained in what to do. And then I am also able to sing it. (Music professor)

> If I am going to perform a piece of music, I must play it every day for a year. The larger pieces for the cello repertoire are typically 45 to 50 minute pieces. I wouldn't feel comfortable in public without practicing it every day for a year. It's repetition. (Music professor)

Business management professors concentrated on the patterns and application of the material to make memory meaningful. One professor said "There is only so much I can keep in my head." The volume of material available to and used by these professors make the patterns of memory useful. The utility or functionality of a theory or important information made it much easier for them to remember it. Again there was mention made of repetition as a tool for remembering.

> I remember things in a kind of pattern. It fits into what I know and have experienced. It integrates into an arranged pattern. There is only so much that I can keep in my head. If you can put things together and show yourself that it is useful, you are much more likely to remember. If you can remember it's application, you don't have to remember the tool, because you can always go back and look it up. (Business management professor)

> I am not one of those professors that has good recall for details. I will remember that I read something really important, perhaps what journal it was in, and then I'll go back and usually find it. I usually remember things that I have heard, but I also should mention that I almost always take copious notes. (Business management professor)

> I'd probably take all these notes. Then I would review the notes a bunch of times, and I would eventually come up with an organized outline of those notes. I mostly use repetition. (Business management professor)

Motivation to Maintain Professional Interest. Another issue of importance to this study was the motivational forces that keep these professionals interested in continued learning. What incentives have captured their curiosity and made it possible for them to maintain their ambitious professional schedules and look forward to continued learning in their work

with anticipation? The passion that these professors bring to their learning and professional practice, their love of learning and teaching, and their ambition to make a difference in the body of knowledge and a contribution to learning was common to their observations.

Physics professors spoke of the challenge of their field as a motivator. They related the awareness of continual new findings in physics that captivated their interest in search of the answer at the next level. The challenge of problem solving through experimentation generates their curiosity.

> I think it's easy to stay interested in physics because there's always a sense of movement in the field. There are major problems that people define and make progress on. Although it sometimes seems that things progress fairly slowly, when I look back over a span of years, I can see a lot of progress in the field. So there is a sense that we know a lot more and understand a lot more than we did when I was starting out. The sense of movement, the sense that we don't have to go back, that there are revolutions that change the ways that we look at things. There are always surprises, but we don't feel like we're always probing the same ground. (Physics professor)

> I enjoy the lab work, working with my hands, building things, solving problems. (Physics professor)

> When I was in my post doctoral work, I had the opportunity to travel to Wisconsin. It was an exciting place to be. There were many knowledgeable people in the field passing through there. Now, I am so conscious of all there is to do in the field, but the opportunity is here to work, and it's fun, challenging, and satisfying. (Physics professor)

The history professors talked of the freedom to pursue the intellectual challenge of an interpretation of a good story. The internal motivation of individual improvement in the development of the creative process of research

and writing was indicated in their responses. The literary experience of a good historical narrative was sufficient reason to continue the study.

> I'm still very passionate about it. I love teaching, I really like to do research and writing. It's the most creative part of my life in lots of ways. (History professor)

> History, as it is ultimately produced, is a form of literature. If you have any interest in literature in general, it is just a special form. Reading it simply for the pleasure of the literary experience is often sufficient motivation. It is often like reading a very good novel. It may be structured a little differently, no surprises at the end, but it is indeed an extraordinary way to explore the human condition. (History professor)

> I like a good story, and history is full of good stories. I like to write, and I like to deal with the voices of the past. Those are very rewarding to me in terms of researching and writing. When I first started graduate school I was overwhelmed by the volume of books in my professors offices and I thought "My God, there is nothing left to write about." Now I think, "My God there's so much waiting to be uncovered and written about." (History professor)

> Satisfying my own intellectual curiosity. I am given an enormous amount of freedom to explore whatever is interesting to me at the moment. There are few professions which allow that. This one does. Individuals are basically internally motivated. We talk about incentives all the time, but my own feeling is that if it requires outside incentives, it probably will not work. (History professor)

The music professors talked of the continual improvement of their instrumental skills and the challenge of the accomplishment of new music as motivational initiatives for the continuation of their work. They also spoke of their responsibility, both personal and professional, to share their insight into the field with students, colleagues, and other professionals.

> It's like golf in that you can always get better. I could play full time clarinet for the next sixty years and never feel like I've been there, done that. (Music professor)

> It's an avocation. I don't really feel that I've had any choice. It's not that I regret it. Definitely it's something that I feel I have a gift for and feel a real responsibility for. I feel so privileged because I've had extremely good teachers. I feel a responsibility to pass it on. (Music professor)

> I take the music very seriously, because I think it is a universal expression, not of another language or anything like that, but I think that it can be important in the development of ourselves. (Music professor)

The business management professors commented on the interest that the breadth and variety of the subject areas within their field created. Their ability to increase awareness, in the management field, of application and function of models and theories was exciting for them. The variety of professional opportunities available to them for the expression of their work was appealing.

> The thing I like about being a professor is the flexibility. You have the opportunity to do independent work, collaborative work, research, to work with students and teach, which is really exciting. (Business management professor)

> The fun is that you see many of the students open their minds up and come to that awareness and succeed. (Business management professor)

> I like both the subject areas of human resource management and organizational behavior. I think it is really interesting. I think what goes on with, and for, and around, and about people in organizations is just interesting. (Business management professor)

Methods Used in the Field for the Creation of New Knowledge

The process that characterizes creation of new knowledge in each discipline was examined in this study. How does new information come into the existing body of knowledge in the field? What influences the procedures and practices of the creation of new information?

The findings on new knowledge are addressed in this study in three sections: methods used to create new knowledge in the discipline, the time frame needed for the knowledge to become a part of the critical mass of the body of knowledge, and the contribution of academic sabbaticals and professional development activities to the creative process.

Methods of Creating New Knowledge. The physicists identified laboratory research or theoretical research as the primary source of new knowledge in their field. They look for the method to either prove or disprove a question through either laboratory experimentation or model building. They talked of strict control of variables in search for the "one answer."

> It's done through research. As an experimentalist, you start out with some ideas that you think might prove or disprove something, or further your understanding of some process. You design and create the experiments directed toward that goal. (Physics professor)

> Break the problem down, simplify it, make a model or an approximation of the problem that you are trying to solve. After you do that, you go back to the beginning and add some more complexity and do it over again. This is a pretty standard approach for physicists. (Physics professor)

> In physics theory, it's like doing numerical experiments. It fits into the learning. Whenever you've identified some area you don't understand but you think you have a handle on how to proceed, you do calculations, computer simulations, and modeling of various kinds. (Physics professor)

> We have these data that we don't understand. What is going on here? So we try to construct some model which we think gives us some insight. (Physics professor)

> For a given problem in physics, we tend to think there is one answer. There are equations written down and those equations should give you one answer. If there isn't one answer, it's probably because you don't have control of all the variables. (Physics professor)

Historians talked about a much less structured and informal pattern that supports the creation of new knowledge in their field. They emphasized the integration of the personal perspective that the historical researcher brings a new point of view to the explanation of past events in history. The historical data exists, but the process of ferreting the information out of obscure personal and public records involves creativity and persistence.

> Just to look at different kinds of questions and ask the questions of different people in the past. A lot of this kind of research, of the quiet voices, depends on a statistical analysis of a variety of records that were kept. You can begin to get at the behavior of some of these people through those records. For example, church records of births and deaths and being able to chart family sizes. It takes a tremendous amount of work to chart this over time and find out what's happening. You don't have diaries or letters from these people, who for the most part were illiterate, or at best inarticulate. Records were kept by alms houses. There are court documents and other indirect records. Then I begin to figure out what was going on as best I can from the surrounding records and deduce what I can, or try to make the best idea I can out of that. It's a problem solving in that way that I really like. (History professor)

> The history has always been there in the sense that the records have always been there. The sources were always there. Women kept diaries, and wrote letters. They are in the census files and in the court records, but no one had really paid attention to those stories before. However, when the women's movement started in the 1970's, women were trying to achieve political aims. They began to look to the past to try and find models for doing their work. So you have people studying minority groups, immigration, ethnicity, labor movements. During that process, new historical perspective is created. (History professor)

> Then primary research would be done on the appropriate sources dealing with those topics. I would use the yearbook of agriculture, general studies of economic departments of business activity, and union literature to begin to synthesize the sources on my own. (History professor)

New music knowledge was addressed by the participants for both history and composition. The historical research is done on a similar pattern to the history study, but new music is primarily created through the individual and collaborative efforts of the artists contemporary to the field. The professors talked of the rigor and discipline required of that creative process. It is not as spontaneous as may be commonly thought. It is a study in dedication and commitment and a lifetime of practice.

> Someone writes a piece, and they send it to their favorite (clarinet) player. That person plays it, and hopefully they can get other people to play it . Hopefully they can then get a recording made and get it published. Ten years later it might start to appear in universities. Then, to analyze all of that in the context of all the other music that is being written, it takes about 50 years to assess what went on. (Music professor)

> The discipline [rigor] of music is sometimes far removed from the actual spontaneity of the same musical form. In order for them [musicians] to feel like they've really done something and for this to become a truly esthetic experience, there has to be a tremendous amount of discipline woven into it. Discipline makes them free. Without the discipline, they

> can never feel free and spontaneous in their expression of art or music. (Music professor)
>
> Most people think that art work is spontaneous talent. It is not spontaneous talent. In the final analysis, the student can only go on natural ability only so long. They come to a point in their education and in their ability to teach others where they can't go any further because they don't have the tools. It requires tremendous commitment and dedication. What people do not understand about students is that in order to involve themselves and immerse themselves in any artistic class, it takes tremendous attention, and dedication, and commitment, and discipline for them to be able to reach any kind of heights in esthetic expression. (Music professor)

New knowledge in business management does not originate from a singular source, but from a variety of sources including academicians, practitioners, and consultants in the field. The process is diverse and rich in collective origin. Although their theories sometimes prove ineffective when applied to a different business or under different conditions and circumstances, each one contributes something to the total knowledge base.

> Some of it comes from academics, but also from practitioners and consultants as well. The magazines, *Fortune, Forbes,* and *Harvard Business Review*, that practitioners read more, will have articles written by extremely successfully consultants. These probably get a lot of their information through experience instead of script research. Many of the more interesting ideas have not come from academics in my field. The experiential component is important to information for this field. (Business management professor)
>
> It is a comparatively research based field. There are academics at universities who are collecting data, coming up with hypotheses based on theories. Literature reviews are coming up with hypotheses and testing them, doing empirical research and then writing them up and publishing them in academic journals. (Business management professor)
>
> Our theories are not very powerful theories, and so there is almost a series of quasi religious movements that occur, not

> unlike education, frankly. There have been a whole series of them that have made individuals a great amount of money, but as one follows the logic and tries to implement them you find that they are not as powerful as they might have been. Each time someone comes up with yet another little piece of the puzzle. (Business management professor)
>
> A lot of the innovations have been implemented before they are written up. It is different than in the sciences where it's coming from theory. If it's not done by practitioners, it's done by academics in a consulting role and then written up. You know it worked one place, at least. It's not totally fanciful. (Business management professor)

Time Factor. One recurring point of difference in this study was in the time needed for new knowledge to become integrated into the existing body of knowledge inherent to the field. Some of the data immediately becomes part of the knowledge supporting the scholarship of the field, but other information takes years to become an incorporated part of the scholarship. Physics professors talked of the need to get "preprints of articles" to be on the cutting edge of current research. Music professors talked of 50 years for a composition piece to "assess music in the context of all the other music that was being written." The time element required for information to become integrated into the body of knowledge of the disciplines showed great difference.

In the case of the physics field, current journal articles are not always timely enough for the cutting edge information that is sometimes required. The researchers need to know what is happening in the field as it occurs, not as it

is being reported. They need to network with their colleagues in other research laboratories to know what is happening.

> If you're trying to write a research proposal that is fundable, you cannot rely on data that is published. You certainly have to make use of that, but you do have to find out who is doing what and where now in the field. It's not sufficient for me to read journal articles, because those are already out of date, they don't represent the state of the art. You have to talk to people and you have to get preprints. (Physics professor)

> The problems I work on tend to be those that they can also test in the laboratory. Predictions that one makes can be compared with data. So, that's fairly immediate. (Physics professor)

The time frame is more flexible in historical study in the lapse of time between the occurrence of an event and the interpretation of that event. Time does not appear to be a critical factor in the perpetual analysis of the past from more informed perspectives and different experience paradigms. These professors are studying the Civil War, mining in Butte from 1914-1941, and issues of runaway slaves. The perpetual nature of new perspective on any historical incident keeps the process going.

> Each generation brings its own perspective. New generations, having new experiences, simply bring a whole new set of those experiences to the process. It is ongoing. It never really ends. There is no normative history, that once is done never has to be done again. We're still writing on the Civil War, trying to understand that structure. (History professor)

> There are things that should have gotten there [into the accepted body of knowledge] a lot quicker. People who we now know wrote on gender issues in the 20's and 30's but were never published. Social constraints just did not allow them to surface. Eventually some of them get published after the historians die, not often, but there are a few cases. (History professor)

The music discipline posed an interesting perspective in this issue of time. The nature of the study of music appears to be cyclical and involves recurring revivals of work done by perhaps much earlier composers. The time lapse between the composition and integration of a musical piece into the accepted body of knowledge may be many years.

> The first thing to understand is that music is cyclical, the pendulum swings as to what types of music we hear. Periods of music have different representation of compositions. (Music professor)

> Then, to analyze all of that in the context of all the other music that is being written, it takes about 50 years to assess what went on. (Music professor)

> Bach was very obscure in 1800. He died in 1750, and 50 years later he was not well known. Mendelssohn came to know the works of Bach and said, "This is a fabulous composer." There started a huge revival, and now Bach is a household word. (Music professor)

Again, the diversity of the business management field is revealed in the evaluation of this time issue. The impact of legal court decisions are almost instantaneous, while theories surface more slowly. Many of their theories cycle with business practice and do not always have a permanent effect on the practice of their profession.

> In the case of legal issues, a court decision creates instant new knowledge. It is important that practitioners, consultants, teachers and students have this kind of information right away. It is immediate and decisive. (Business management professor)

> I think you're not doing your job if you do not allow your students to see what a particular approach is attempting to do. One way to do it is within a context of the historical coverage of the field. How have these things happened in the past? This is one more approach. It carries some truth. It is going to work for a while

> and then there will be a new one. We need to expect that. If we can see where the field is going and where it has come from, we are better able to keep track of the latest innovations and not expect too much from them. (Business management professor)

The final point to this issue of how knowledge is created within a discipline examined the use of the academic sabbatical leave and professional development activities to increase the existing knowledge base. What would be considered constructive use of a sabbatical or professional development activity?

Much of the professional time spent in professional development ultimately contributes to the process of knowledge creation. Many of the participants spoke of using the time of a sabbatical to gain exposure in the culture of their discipline in some geographic locale outside Montana. However, one physics instructor said he felt the time would be well spent continuing his work in his well equipped campus laboratory.

> I'm doing everything here pretty much the way it needs to be done. What a sabbatical would provide me with is time. Why should I go away? Why don't I take the valuable commodity of time and use it right here in my laboratory? (Physics professor)

> I think I would probably visit different research groups in the country and find out what they are doing with their research that would apply to my research. (Physics professor)

> In the last sabbatical I was granted, I had an invitation to join a research group in France for a year to work on some problems that were fairly new to me. I was able to look at new problems and interact with new people. It was a very valuable experience. (Physics professor)

> I would use the time to work on research for either a journal article or a book to be publish. (History professor)

Time away. If you're going to do serious history studies, you have to leave Bozeman. You simply cannot do them here. It's a problem we have, but one that we have to learn to live with if we're going to keep people here who are first rate scholars. And that scholarship is what informs good teaching and is one of the reasons why we have such a strong department. (History professor)

In our field, basically, people take a sabbatical to get exposure that isn't available here. To go somewhere to study with someone would be an experience that you can't have here. Rejuvenation and inspiration and professional development that we find in our isolated town of Bozeman to be unavailable. (Music professor)

Most of all I'd probably go to South Africa and study the music that I never had a chance to do, Zulu music. Then I'd like to compose it for the cello. I really feel that it is the most important thing that I should be doing. I have composed several pieces that I really am quite proud of, but I haven't had the time lately to write. (Music professor)

A sabbatical for me would be a moment for refreshment, to recharge my batteries, to travel, to hear wonderful things, to see wonderful things, to refresh my mind. I don't necessarily think a teacher has to go school or to do research to become more effective. Any sabbatical I took now would be purely for edification. (Music professor)

One thing that I thoroughly enjoy is interacting with other cultures. I would like to go to someplace and do research, mainly on the learning process. I've got three or four research projects, as all people do, that have been sitting on the back burners for too long. The data that is getting outdated. Time to actually get that done, that's what I'd do with it. (Business management professor)

Primarily, I'd use the time to get a new research program going, to do the kind of intensive library research, reading the current literature. (Business management professor)

What I proposed to do was to do some research on human resource issues of interest to small businesses. Lots of the research is based on large businesses, they do job evaluations and they do wage surveys. Well, I maintain that it is not of

> interest to a business that has seven employees. Because so many organizations have small numbers of employees, I think we should be rethinking the things we are doing research on and focusing on. (Business management professor)

Reported professional development activities accepted by the various disciplines reflected the scholarly ambitions of the professors in the field and paralleled the described use of sabbatical time. Comparisons can be drawn between the reported uses of professional time and the methods used to validate knowledge in the disciplines. Historians talked of writing books and articles as valid uses of professional development efforts. Business management professors also referred to writing, but for refereed professional journals. Music professors talked of the value of the opportunity of exposure to the masters in their field that would not be available locally.

> Writing books and articles predominately. Presentations at conferences is considered the next tier down, essentially. (History professor)

> In our field it's almost always refereed journal articles. To write in sufficient volume and to be recognized, you have to be teaching at a doctoral level. (Business management professor)

> To get a chance to perform with internationally recognized people. The New York String Quartet, for instance, came to Bozeman and some of our faculty got a chance to play with them. Going to work with world class mentors is another professional development activity. (Music professor)

> National and international recognition, whatever that might take. To be a performer or speaker at conferences, recordings, perhaps. You need to be heard. (Music professor)

One physics professor summarized the impact of sabbatical leaves and professional development activities on the education profession in the following

statement. Insight into the administrative as well as environmental aspects was provided. He considered the opportunity for release time an issue of culture as well as one of economics.

> The scholarly activity, whatever it is in that field, is part of the expectation. You could have very highly trained teachers in a high school, but they are not going to be generating information, generating knowledge, and generating new perspectives, because they won't have the opportunity. Maybe the most crucial thing they [professors] need is to have the time. That really is a question of money, because it means keeping their teaching loads at a manageable level so that they have the opportunity to do something original. It is a resource issue, but it is also a culture issue. (Physics professor)

Methods Used in the Field for the Validation of Knowledge

The next category of investigation for this study concerned the processes that the disciplines use to validate the knowledge that is created in their fields. The interest was in how the members of the profession make the decisions concerning whether or not new information is representative of and contributory to the knowledge base of the field.

The physics participants discussed observable and measurable standards of verification of theory and experimentation. Quantifiable methods in controlled conditions are usefed to verify the data under investigation.

> There is testing that has to be done on every theory. Some theories seem to pass the test quite well. The theory of electrons and light, quantum electrodynamics, for instance, appears to pass all the tests very well, so far. It doesn't mean it won't fail later on; it just seems to pass very well right now. (Physics professor)

> I think one of the hard things to get through to students is that you don't prove that models are correct in science, you can only prove that they are incorrect. You can show that the theory is wrong, you can't show that it's right. All you can do is show that it is consistent with measurement. (Physics professor)

> For a given problem in physics, we tend to think there is one answer. There are equations written down and those equations should give you one answer. If there isn't one answer, it's probably because you don't have control of all the variables. (Physics professor)

> Generally when you read something, it has been proven on an experimental bases. Then the critical part of it is if it can be applied to other appropriate areas and still hold up. (Physics professor)

> Every so called fact that you have, you need to think about carefully to understand what was observed, what was measured, what were the limits to the certainty there. Some so called facts are better labeled that than others. The sun comes up every day, that seems to be a fact, but in fact it's not the sun coming up, it's the earth going around. That is something that is verifiable also. But the chain of reasoning by which that verification takes place is a complicated one, even the fact that the earth spins on its axis. That took thousands of years to arrive at and people need to be aware of how much reliability can you attach to indirect evidence. In some cases a lot, and some cases you need to think about it. (Physics professor)

The validation procedure for the work of an historian is done by the collective critical analysis of peers in the field, sometimes through refereed journal articles. Books are reviewed, collective feedback from peers is contributed, and the historians search for the "explanatory power" of a new perspective.

> Usually new ideas come up at conventions in general conversations with old friends and colleagues about what everybody is doing and someone is beginning to work in this kind of an area. You begin to get a feeling of something new on the horizon. Probably sometime within a year or two after that you

> begin to see articles appear in the major journals. We become aware of the explanatory power that this might have or does not have. If it holds, it survives. If not, you don't see much of it. It's quite eclectic, not a formalized way of doing things. (History professor)

> An historian reviewing a book would look at the author's sources. How well have they covered the available sources? How clearly have they presented a thesis? How well have they constructed an argument? Is it a compelling narrative? Does it make a contribution to the field? If this is the history of the Civil War, is it something new that we did not know before, or is it giving us a fresh light on a controversy or event that happened before that enables us to affect the significance of it? In many ways, the governing question for the field in terms of interpreting the value of what a historian does is the "so what" question. Why should I read this? What is the significance of it? What is it going to mean to me as an informed citizen, to reshaping the history of the nation, or to students when they read it? (History professor)

> So what we find ourselves doing constantly, as these new ideas and new ways of looking at things come up, is trying to integrate them into what we already know. Ultimately, we continue to create a synthesis in which these new ideas are woven into the old ones. The way a new perspective is validated or is evaluated is by how well it integrates into everything else. If it indeed adds explanatory power to what we already know, then generally it becomes acceptable. If it does not, if it seems to be isolated from everything else, then it remains one of perhaps interesting curiosity, but not likely to remain. (History professor)

For instrumental music, validation is a function of public performance. It takes time to have the music accepted by a public audience that is either willing to listen to the performances or buy the recordings. Historical revivals of what are now considered classical works of art have been prompted by the discovery of music written sometimes decades earlier.

> Through performance. Music gains its notoriety through repetition of performance. It falls on new ears that accept it. It fall on new ears that are challenged by it, and becomes a part of their repertoire. (Music professor)

> Most of the stuff that's written about 20th century music, stops at 1950 or so, because you sort of need time to assess what comes out and it takes a while. Someone writes a piece, and they send it to their favorite (clarinet) player. That person plays it and hopefully they can get other people to play it . Hopefully they can then get a recording made and get it published. Ten years later it might start to appear in universities. Then to assess all of that in the context of all the other music that is being written, it takes about 50 years to assess what went on. (Music professor)

Validation for business management is experiential based and uses practical application as the primary criterion. The utility of the theory for a particular business circumstance is the ultimate confirmation of its worth. They are looking for techniques that managers can use in practice.

> It is different than in the sciences where it's coming from theory. If it's not done by practitioners, it's done by academicians in a consulting role and then written up. You know it worked one place, at least, so it's not totally fanciful. (Business management professor)

> I test it against my own experience or experiences that I'm currently having. Does this match something that either I've experienced in the past or explain something that I couldn't understand in the past. This is a great study with high statistical significance, but can a manager use it? (Business management professor)

> A lot of it is esoteric because its academic empirical hypothesis testing research and a lot of people say that data is not practical. Some of it, though, ends up being very practical and the theories are eventually applied in organizations. (Business management professor)

Participants' Awareness of Learning Preferences of the Students

The final question for this study was to look for evidence of the awareness by the professors of the individual and/or collective preferences of

learning styles of the students in their classrooms. The point of inquiry was toward the impact of that consciousness upon the participants' awareness and professional practice. The question posed was whether or not students in their courses approached learning in the same manner as did the professors. The responses demonstrated a strong recognition, across disciplines, of differing learning strategies among their students.

The recurring and often iterated problem of large class sizes inhibiting individual attention to the students was addressed by one of the history professors.

> Trying to figure out how students learn is a constant challenge for teachers, and its a bigger problem as the University gets bigger and the class sizes get larger. Even in a class of 35-40 people, I have a good handle on how most of the people in that class are responding to both the content and the style. I can accommodate and shift gears to help them. Unfortunately, I think one of the greatest problems at the university level is that the largest and most impersonal classes are at the introductory level, and that is alienating to students from small communities. It is very frustrating for faculty because you don't have a sense of connection to these students. A professor cannot do anything to increase retention rates for the University. You are put in a position of flushing people out who cannot cut it on their own in that first semester. (History professor)

> Work problems, that is how I tell my students to learn. My students tell me they learn the way I do. As an example, when I teach the introductory physics class, I and many others in physics assign maybe three homework problems per lecture, due at the next lecture. This is a lot of work, might be at least two or three hours of work. At the end of the semester, they look back and say that yes it was a lot of work, but probably I learned quite a bit. I don't know if I would have learned this much without the intensive work. (Physics professor)

> I worry about it all the time [how the students are learning]. I think it's very important because so much of physics builds upon

itself. If you are lost in week one, you will not even be in the same universe in week three. Some of my students learn the same way I do, but some don't. It depends on the level. In the 400 level, those people are the ones who will end up being physicists, and are more likely to be closer to my learning. Among physicists, I think there are a lot of similarities in the way we learn and they are probably different from other fields. (Physics professor)

Professors in the history department talk about student learning all the time. They are cognizant about the process and look at it continuously. (History professor)

Student learning is something that is dynamic and always in process. How do you investigate a problem of interest historically, and then how do you as a person factor that into the way you read society, both past and present. Learning activity, where you actually are challenged to integrate information to arrive at generalizations that are not provided, is the leap that we are always trying to get the students to make. (History professor)

They are getting a lot of raw material, from which they should think about, bring their own experience to their own understanding of the world in which they live, and draw those generalizations from it. Those generalizations can be challenged and are debatable and argued. To the degree that it begins to challenge their own fundamental beliefs, it is often a very difficult thing for students. To the degree that we force them to do that, I think, is the measure of our success. (History professor)

This forces students to think deeper about it, and that is our approach. The idea of trying to get students to integrate information from all kinds of different sources, economic, social, and legal that all fit together in people's experiences. Why do people act the way they do? Why do they believe what they do? Why do you believe what you do? Is it kind of an acceptance on faith, or is it an articulated, well developed idea that comes out of both your own experience and whatever vicarious experience you get from this study. (History professor)

A well constructed argument presented in a coherently written paper in my class will be a useful skill, even if they forget everything about American history. (History professor)

> No, no, my students learn very differently than I do. My individual cello students all come from different backgrounds. They're music majors, and engineers, and pre med. (Music professor)

> I'm aware of the way I want them to learn. I want them to learn two ways: fundamentally to get the essential tools that they will need, the musical language, and I want them to develop their own musicality. I want them to develop their understanding of their art. I'd like them to experience a little bit of artistry before they leave here. I can't teach them to teach, but I can try to give them some idea of what it's like to teach and the tools that they need. (Music professor)

> They don't want my perspective, they have to have their own. What I have to do is focus on process. How they're getting there, what they're incorporating, whether they're applying the theory properly. You can't grade the conclusion, you have to grade the process. I'm a constructionist. Learning is building it yourself, from scratch. You can't learn from someone else's teaching. You have to learn from your own experience, even if it is vicarious. You build it in your own head, yourself, based on who you are and what you have learned. (Business management professor)

> The students should have an appreciation for what we're about from the structure of course design. The way we structured the course is a form of mentoring. Even though they are not studying learning per se, they are not education students, from the perspective of a leadership model they should be quite aware of what's going on. We started with a unit on learning styles of adult learning. So we can ask them how they are doing in meeting the objectives and they have a better chance of managing their own learning. (Business management professor)

The following comprehensive closing statement on this issue of professor awareness of student learning summarizes andragogical theory. It is not a quote from the work of Malcolm Knowles, but it echos the principles of adult learning theory.

> The role of the instructor is not just to hold forth with wisdom, but to manage the environment within which people can learn

> effectively, with particular sensitivity toward different learning styles of the students and different places on the maturation scale for students. So you try to move them positively in their learning, with them being the controlling factor. The role of undergraduate education is to help people to become self-managed learners. (Business management professor)

Reflection on Learning

Selected reflective remarks from the participant professors on their individual insight and personal vision of their educational practice would be appropriate in closing this discourse on the findings of this study. Some of the commentary from the interviews was very thoughtful. These professors are impressive in their dedication to their work.

> A teacher in history, I think, has to have two things. One, I think they have to understand that they are an historian and they are not just teachers of history, that they create history. I think that all historians understand that either explicitly or implicitly. And I think what really makes history work in the classroom is that they have to bring absolute passion to the subject. That becomes obvious to it when you're doing it, and the students get caught up in the same kind of passion for the subject. So even if they don't pursue it for themselves, they retain that memory of the subject. (History professor)

> And there's a body of knowledge that we share. As in all other sciences or education, we have the sense of being just a little stone in the wall. You know the body of knowledge that precedes you and you get to add a little bit more to it. Then the students that you teach can add their stones, and so on. (Music professor)

> I know I can't keep this pace up. I know my priority is with teaching. I don't find teaching particularly easy. It's the hardest work there is. I'm also compelled to do it. I know I can help. I know I can see things and I hope I can make a difference. (Music professor)

> This is a matter of the soul, and there's no way that I can explain it. It happens because we're human. That's why it happens. Because somehow or other we start to feel differently. (Music professor)

> But you see, this [studying esthetics] is one of the ways we change, as teachers. If we don't change, we don't grow. The teacher who gets in a rut is a teacher who stops perceiving the mystery of his subject matter. They stopped looking for the secrets. Its our job as teachers to motivate the learner to perceive those same things. (Music professor)

> The other aspect of it is that I think the very creation of music, in and of itself, has a great deal to offer. It's an art form that speaks very eloquently about the condition of man. It's not necessarily entertainment. It's not pep band, it's not jazz band, it's not marching band, it's not jazz choir, it is the personal testimony and witness of man's condition by a human being who sets his thoughts or her thoughts down for us to experience so that we can understand ourselves better. In and of itself, that is what music is. That is why I teach. (Music professor)

Summary

Twelve practicing professors were interviewed for this study to describe the way that learning occurs and knowledge is organized and processed in various academic disciplines. The sample was selected purposively because the participants were considered to be a rich source of information on discipline specific learning. They were chosen for participation in the study based on the selection criteria of teaching experience in the field, peer recognition from within the academic profession, insight into their own learning process as well as that of their students, belief in the depth and breadth of professional experiences to contribute to the inquiry of this study, and professional interest in the project.

The four college academic disciplines examined into this study were physics, a hard science field; history, representing the humanities field; music, a study the arts; and business management, an applied science. These disciplines were chosen for their diversity and representation of college academic fields of study.

The findings of this study describe the learning strategies and knowledge organization techniques as used by the participants, methods used in the field for the creation of new knowledge, methods used in the field for the validation of knowledge, and the participants' awareness of learning preferences of the students in their classrooms.

Differences in learning were apparent in the four academic disciplines of this study. These differences have impact on the learning and teaching in higher education. The conclusions and recommendation presented in this study address those concerns.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Overview

The impact of the academic discipline on learning and teaching in higher education is an area of educational interest, but one which has had little research attention. Problems arise from our lack of knowledge of the importance of the college academic discipline on learning and teaching.

> To improve instruction and to interpret student ratings appropriately across disciplines, we need to increase our knowledge and understanding of the causes and consequences of disciplinary differences in teaching and learning. We need to know the structure and organization of disciplines, the culture and environment in which teaching takes place, and the differences among faculty and students across disciplines regarding their attitudes toward instruction, their goals, beliefs, values, philosophies, and orientations. University faculty need to know more about good teaching approaches in their particular disciplines, and about the problems and difficulties of their students in learning their particular subject matter. Faculty developers need to understand these issues in order to improve instruction in particular domain areas, and administrators need to recognize differences in students' evaluation of their instructors in different disciplines in order to make appropriate decisions. (Hativa, 1995, p. 2)

Do scholars in different academic disciplines use different strategies to learn the material required for their field? Are there techniques for learning that are more effective for one discipline than another? Would these learning

strategies have importance for student learning and decision making? How is knowledge created and validated in different disciplines? Are college professors aware the way the students in their classrooms learn?

> However, despite their practical and pervasive influence, the disciplines themselves have been subjected to relatively little systematic study, especially in their effect on the quality of teaching and learning in higher education. We need to increase our knowledge and understanding of the causes and consequences of disciplinary differences in teaching and learning. (Hativa, 1995, p. 1)

The purpose of this study, therefore, was to describe the way that learning occurs and knowledge is organized and processed by professors in various academic disciplines.

Qualitative study methodology using a naturalistic research design was chosen for this study. The targeted population was college professors. This sample was chosen primarily for two reasons: first because teachers are first learners and therefore have insight into the learning processes they use to attain and organize content specific information, and second expert practice in the education field gives them both the experience in their field and the insight into the learning techniques used by themselves and their students. The professors were believed to be a rich source of the needed information and that their input would make a valuable contribution to the data for the study.

Extensive personal interviews were conducted to examine the research questions:

1. What learning strategies and knowledge organization techniques do college professors in these disciplines use?

2. How is knowledge created in the four different disciplines?
3. How is knowledge validated in the four different disciplines?
4. Do college professors recognize the learning strategies used by their students?

Review of the Sample

Through their responsibilities to formal education, professors function as gatekeepers for the information that is disseminated to students in the classroom as well as through the professional educational journal publications. Through curriculum design, textbook choice, and critical analysis of information in their field, both new and old, they filter information for presentation in college classrooms. This role makes their contribution of information to this study of particular interest.

A sample of twelve professors from the four college disciplines of physics, history, music, and business management was selected for this study. The disciplines were chosen to represent the fields of hard science, humanities, arts, and applied science. The professors were purposively chosen to meet the selection criteria of teaching experience in one of the four academic disciplines; peer recognition from within the academy for the expertise, insight, and interest in their own learning and the learning of their students; belief that the depth and breadth of their professional experiences would contribute to the data of interest; and interest in the project.

The range of years of teaching experience in their disciplines was from 6 to 35 years, with a mean of 18.25 years and a median of 15.5 years. Of the twelve professors, seven were male and five were female, which demonstrates stronger gender equity that was present on the Montana State University campus. Although gender was not a controlled variable in this study, at least one female from each department was chosen to provide gender perspective in the study. With the exception of one professor, all the participants had earned doctorate degrees.

All of the professors who participated in the study had current teaching assignments in their respective departments at the time of the study. In addition to teaching duties, many of them had administrative responsibilities and most of them were also carrying responsibilities for their own research projects as well as supervision of continuing graduate student educational research.

Review of the Findings

The basic concern of this study was to look at academic learning and knowledge organization and processing techniques of scholars in different academic disciplines. The results of the interviews showed differences between, and, even at times within, the four disciplines. The methods used to learn the information that is fundamental to the scholarship of the different fields of study are distinct and at times dissimilar.

Physicists approach learning in search of a definitive answer. They work with precise mathematical models and repeated laboratory experiments. Their process is carefully documented, accurate, methodical, and replicable. The problem, just because is has not been solved, motivates them to continue their work.

Historians work with a much more interpretative perspective. Historical facts are the raw data in which their inquiry is founded. They are looking for new meaning to interpret past events. There are few definitive answers for their study because the process involves the very intimate and personal experiences of the history researcher. This is not to assume that they have total freedom to rewrite history to suit their personal imagination. They are bound by professional ethics of attention to the original intent of a primary resource or of another historian.

The experience and expression of esthetics holds the meaning of learning in music. Their study is the rigorous and disciplined search for artistic freedom. This is a holistic pursuit that demands the total attention of the learner. Lifelong learning holds significant meaning for musicians. Many times the recognition of their work doesn't occur for decades after the end of their professional careers.

Business management professors work with diversity. The nature of their study demands mastery of all or parts of multiple models and theories. They are looking for practical application of their learning, it has to work for the manager in the field. Businesses are as atypical as the operators and owners,

and the application of theory in business management is therefore customized to each individual business situation. These people are also problem solvers, but the right answers are not nearly so apparent.

Learning strategies and methods used to create and validate new knowledge parallel the patterns of the basic differences for the disciplines. Knowledge is created in physics through experimental and theoretical research and validated through repetition of the experiments in the laboratory. Creation of knowledge in history is through an eclectic, informal, and ongoing process of a new personal perspective of an historian on past events and is validated by the explanatory power that this perspective holds for colleague historians. Knowledge is created in music through the arduous and sometimes lengthy process of original composition of the piece, agreement by musicians to make the piece a part of their repertoire, and acceptance of the work by an audience. It is validated through repetition of performance. And finally, knowledge is created in business management through multiple sources of academics, practitioners, and consultants for utilitarian application to unique and individual business situations. It is validated by its functionality. If it works for the particular business in question, it is accepted and used.

The professors interviewed for this study seemed to have an awareness of and appreciation for the differences in the learning strategies used by the students in their classrooms. They talked of adapting and varying their teaching strategies to give the students the benefits of exposure to a range of different approaches to learning. There also was an understanding expressed

of the differences in the methods used for learning between the professors and their students. The realization of personal differences in learning the content specific material of these four disciplines was established as a useful tool in their teaching and learning practice.

Conclusions

This Study Shows That There Are Differences in the Way That Learning Occurs and Knowledge Is Organized and Processed by Professors in Four Academic Disciplines

These differences have consequential implications for the impact of the college academic discipline on learning and teaching in higher education. University professors can benefit from self-awareness of preferred learning strategies and from the awareness of discipline specific learning differences across the campus. This information is vital for professors to enable them to increase their understanding of their profession and of other disciplines within the university system. Recognition of the multiple realities of the learning process can only make the education profession, and those practicing in it, more cognizant and more confident. A more global perspective of learning across discipline boundaries can make professional learning endeavors more meaningful, more insightful, and more effective.

The Knowledge of Discipline Specific Learning Strategies Can Contribute to Improved Teaching Practice for College Professors. A more comprehensive perception of the methods used by colleagues and learners in all academic disciplines will allow professors to be better prepared to become involved in and to offer a wider variety of learning and teaching experiences. Examples of areas of impact for the practicing professor include giving meaning and direction in the facilitation of learning, having a better understanding of students engaged in interdisciplinary studies, providing counsel for students, and attaining a more global perspective on the learning process. All practicing professors at the university level would benefit from the integration of learning theory into their existing body of professional knowledge.

The Data of this Study Can Also Impact Discipline Specific Learning for University Students. Knowledge of personal learning strategy preferences as well as the unique characteristics of the learning in various college disciplines can increase student learning effectiveness. Early exposure to the research data on the differences in learning will allow them to make better decisions on academic choices, to become more self-directed in the use of learning strategies, and to take greater responsibility for the self-management of their learning process.

The understanding of the process of creating and validating knowledge within the discipline can positively effect the professional practice of scholars in higher education. The professional practice of college professors can be impacted by giving broader scope to their knowledge base. Awareness of the founding basis of new knowledge within the field will extend the abilities of the professor for meaningful contribution to the existing body of content knowledge. Many times, the professors become an integral part of the validation process through their role of the information filter for the formal education field. This information can help sharpen their capabilities and make their practice more effective.

Collaborative Learning is not a Frequently Utilized Method of Learning for Professors in this Study. The professors interviewed for this study reported very little use of collaborative learning processes with colleagues and mentors for their own learning. The exception appeared in physics, where research laboratory teams work together in scientific problem solving. Although collaborative learning is used and encouraged as a learning tool with students, it appears not to be effective for the professional practice of these professors.

The university system process for promotion, tenure, and other acknowledgment of professional excellence emphasizes a competitive reward system. The individual orientation of the organization of higher education promotes the learning methods used most often by the professors within the

system, although business and the classroom encourage a more cooperative and participatory approach.

The professors of this study demonstrated an awareness of the differences in learning for their students. One of the selection criteria for the participating professors of this study was their interest in learning. The understanding they showed of the learning strategies used by the students in their classrooms was therefore perhaps predictable. However, it was evident that the sample for this study had an understanding of the differences in background, experiences, and learning preferences of their students. An interesting note appeared in some cases that these differences seem to diminish as the students approach upper division courses, and the knowledge organization skills of the students tend to more closely resemble those of the professor.

Recommendations

As a result of the conclusions drawn from this study, the following recommendations are made.

Discipline Specific Professor Awareness

Data on the differences in learning in the academic disciplines is important for college professors to integrate into their andragogical knowledge base. An awareness of personal learning strategies is fundamental to insight

into how others learn. Deeper understanding of the profession can promote more meaningful participation in and more valuable contribution to the field. It is recommended that information concerning discipline focused research be dissemination to practicing professors within the university system. The dynamic nature of these studies provide topics of discussion for seminars, inservice training, and professional development opportunities.

New Hire Orientation

To ensure consistency across discipline borders of the awareness of individual and discipline specific learning strategies, it is recommended that the orientation of new teachers entering the university system include awareness of learning preference differences among professors. The benefit of knowledge of learning differences theory will increase their effectiveness and efficiency with other faculty, discipline specific students, interdisciplinary students, as well as in their own learning.

Professional Development

The statements from professors of this study concerning professional development and sabbatical leave often express the need of making the opportunity to get involved in other cultures within their discipline but outside their current environment. The felt it is often necessary for them to get off site and become immersed in learning at some other geographic location. The benefit of a better understanding and more global perspective of a society with a rapidly changing structure of and access to knowledge is noted by Davis.

> As society changes, becoming more dependent on knowledge, more globalized, more permeated with a sense of anomie, institutions of higher education, and the professors who teach in them, are called upon to produce students who can cope more successfully in this new age. Ultimately, the strongest argument for the improvement of teaching is embedded in the broader case for educational reform: To create a better fit between what it takes to live in today's society and what educational institutions provide. (1992, p. 17)

It is recommended that rigorous efforts be maintained to afford the opportunity for and encourage faculty participation in professional development and sabbatical leave opportunities. The focus of this recommendation extends beyond the economic impact on confining budgets of time away for professors. One music professor commented that, "It is a resource issue, but it is also a culture issue." The attitude of energizing, invigorating, and informing the faculty of the opportunity for study outside the environment of the academic department needs to be highly valued and strongly defended within the higher education tradition.

Freshman Student Orientation

Colleges and universities need to equip incoming students with the self-awareness of personal learning styles and learning strategies. Increased understanding of preferences in learning techniques will give the student better tools to manage their own learning and to become more self-directed in their educational choices. The increased confidence and understanding for the learner can help make the higher education experience be more meaningful and successful for the total education community.

It is therefore recommended that an online learning inventory instrument be utilized as an activity during the orientation of new students. The instrument could be available on the campus electronic network for the students to complete at the time of introduction to the computer system. The instrument can be self-scoring, confidential, and have immediate feedback for the students with no requirements of time by faculty or staff.

Discipline Specific Student Awareness

The academic departments need to emphasize to the students the unique characteristics of learning and performance required for successful professional participation in their field very early in the program. "You start that the first day, not the last," stated a business management professor. The traditional model of a senior capstone course can be modified for presentation at the freshman level to give the students an understanding of the expectations of the field before they invest unproductive time.

> The basis for our course is experiential exercise in the profession. The students actually have to go out and start a business the first semester on campus. You set up a system where they feel safe to try behaviors of this sort. The way we structured the course includes a form of mentoring with upper level students in the department, faculty, and business professionals.
>
> Even though they don't master the content in that first semester, they get to see how it all fits together. They get to experience that right away without being hung up on right or wrong content. They have a feeling for it. We start with a unit on learning styles of adult learning. (Business management professor)

It is recommended that discipline-specific study techniques and learning experiences be integrated into departmental curricula at the freshman level, to involve all beginning students, either through course design or seminar format. The College of Business on the Montana State University campus currently has a course developed in their curriculum. Although the content would differ, the model of this course could be helpful in adaptation for other disciplines.

Recommendations for Further Research

This study represents preliminary research on the issues concerning the impact of the college academic discipline on teaching and learning in higher education. Other issues are recommended for further research and study.

First, other disciplines in different academic clusters need to be researched to expand the information from this study. Will differences in learning be evident among other fields of study?

Second, the perspective of teachers who have experience teaching in different disciplines would be a valid addition to the body of knowledge. For professors that teach in multiple disciplines, what changes in learning occur for them when practicing in two different academic environments?

Third, students from various disciplines need to be examined to describe the way they learn. Does their learning of the discipline specific content material coincide with the description of the professors in this study?

Fourth, a study of the learning strategies of students enrolled in multiple sections of the same college classes would provide insight into the impact of

the discipline versus the impact of the individual professor. Is it the power of the discipline or the preference and performance of the instructor that influences learning in higher education?

Fifth, a study of interdisciplinary students would contribute to the expanded understanding of this issue of the cause and consequence of the academic discipline on learning in higher education. Do their learning strategy and organization techniques change from one discipline study to the other?

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APPENDIXES

APPENDIX A

Qualitative/Quantitative Comparison.

Qualitative	Quantitative
Overall Purpose	
Explain, and gain insight and understanding of phenomena through intensive collection of narrative data	Explain, predict, and/or control phenomena through focused collection of numeric data
Approach to Inquiry	
Inductive, value-laden (subjective), holistic, and process-oriented	Deductive, value-free (objective), focused, and outcome-oriented
Hypotheses	
Tentative, evolving, based on particular study	Specific, testable, stated prior to particular study
Review of related literature	
Limited, does not significantly affect particular study	Extensive, does significantly affect particular study
Research Setting	
Naturalistic (as is) to the degree possible	Controlled to the degree possible
Sampling	
Purposive: Intent to select "small," not necessarily representative, sample in order to acquire in-depth understanding	Random: Intent to sample "large" representative sample in order to generalize results to a population
Measurement	
Nonstandardized, narrative, ongoing	Standardized, numerical, at the end
Design and Method	
Flexible, specified only in general terms in advance of the study Involve nonintervention, minimal disturbance	Structured, inflexible, specified in detail in advance of the study Involve intervention, manipulation and control
Data collection strategies	
Document collection Participant observation Unstructured, informal interviews Taking extensive, detailed field notes	Nonparticipant observation Semistructured, formal interviews Administration of tests and questionnaires
Data Analysis	
Raw data are words Essentially ongoing, involves synthesis	Raw data are numbers Performed at end of study, involves statistics
Data Interpretation	
Conclusions tentative, reviewed on an ongoing basis, generalizations speculative or nonexistent	Conclusions and generalizations formulated at the end of study, stated with predetermined degree of certainty

APPENDIX B

Interview Topics.

I want to find out whether educational leaders like you learn in your content area in a specific way. Do professors in your discipline use common techniques to organize and process information and knowledge that is different from your counterparts in other college academic disciplines. The following discussion topics will give us some substance for a personal interview and form the foundation for my inquiry.

If you were given a new course to teach in your discipline, covering a topic you had never taught before, how would you prepare for it?

What processes are most effective to create new knowledge in your content area? How does new information evolve?

Your latest professional journal contained an article introducing a new idea or concept into your field that challenges the traditional thinking of you and your colleagues. How would you evaluate the validity of this new information in your academic area?

How did you study as an undergraduate? Would your study methods be different today? How do you think your students learn your discipline?

What got you interested originally in teaching your discipline? How have you maintained your interest? What is really exciting to you about your discipline?

What would you really like to learn more about in your discipline? How would you go about doing it?

What are considered valid uses of sabbatical time and professional development activities in your discipline?

Do your students learn the same way you do?

APPENDIX C

Letter of Invitation.

Dear:

Please allow me to introduce myself. I am currently conducting research for my doctoral dissertation in Adult, Community and Higher Education in the Department of Education at Montana State University with Dr. Robert Fellenz as chairman of my graduate committee.

I would like to ask your help with my research. I am looking for experienced college professors to help me describe how professors in different academic areas process knowledge and information. Do you use content specific learning techniques and methods that help you organize and learn the academic material required in your field of study? And if so, are those processes different from those of your counterparts in other academic disciplines?

For both interest and diversity, the four college disciplines from the MSU campus considered for this study are History, Music, Physics and Business. If information is processed differently in these disciplines, should teachers be trained specific to one area? Can students be guided to higher levels of achievement using the same strategies as the educational leaders in their field of study? Do interdisciplinary students adapt different processing and learning skills for each content area?

Your experience in your academic discipline and your interest in learning give you expertise that is valuable to my study. I hope you will consider allowing me to personally interview you to discuss your insights into learning in your field. Please refer to the enclosed sheet of discussion topics pertinent to this study.

I'll contact you personally within the next few days to see if you are interested in participating and if you would be available. I look forward to the opportunity of working with you.

Sincerely,

Myrna Doney
Graduate Student

Dr. Robert A. Fellenz
Professor of Adult Education

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