2008

Disciplinary differences in preferred research methods: a comparison of groups in the Biglan classification scheme

Mark A. Alise
Louisiana State University and Agricultural and Mechanical College, mark.alise@pbrc.edu

DISCIPLINARY DIFFERENCES IN PREFERRED RESEARCH METHODS: A COMPARISON OF GROUPS IN THE BIGLAN CLASSIFICATION SCHEME

A Dissertation
Submitted to the Graduate Faculty of the
Louisiana State University and
Agricultural and Mechanical College
in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

in

The Department of Educational Theory, Policy, and Practice

by
Mark A. Alise
B.S., Louisiana State University, 1980
S.T.B., Pontifical Gregorian University, 1984
S.T.L., Pontifical Gregorian University, 1986
M.B.A., Louisiana State University, 1997
May 2008

DEDICATION

This work is dedicated to my daughter, Juliet Irene Alise, my shining light and inspiration.

TABLE OF CONTENTS

LIST OF TABLES

ABSTRACT

The Biglan system of classifying disciplines in groups based on similarities and differences in their subject matter has been validated in numerous empirical studies. The present study sought to expand that validation by comparing two Biglan groups that include disciplines representing the social and behavioral sciences. As a unique point of comparison, preferred research methods were contrasted between Psychology and Sociology forming one group of pure disciplines and Education and Nursing forming another group of applied disciplines. A code sheet was developed to categorize the various components of published research, distinguishing at the most basic level quantitative, qualitative, and mixed methods type articles. Data was collected from research articles published in high impact journals from each discipline. The complete data set consisted of the codes from 150 randomly selected articles from journals in each discipline, or 300 articles per group. These codes were converted into frequencies and analyzed using the Chi-Square statistic. Findings showed there are significant differences in preferences for quantitative, qualitative, and mixed methods research approaches between the two Biglan groups. Significant differences were also found in certain methodological components of the basic research approaches including research designs, sampling methods, and data collection methods. Evidence was also found of the philosophical paradigms underlying methodological choices, and analysis revealed significant differences in the paradigms preferred by the two groups. All of these findings support the validity of the Biglan scheme of classifying disciplines based on differences in the preferred approach to research methodology. These findings also suggest that the Biglan system represents a useful tool for promoting interdisciplinary discourse on research. Directions for future research are indicated that would further confirm the findings of the present study, move towards a wider validation of the Biglan

system, and explore more deeply the philosophical underpinnings of the paradigmatic differences founding diverse research methodologies.

CHAPTER1: INTRODUCTION TO THE STUDY

Overview

Higher education witnessed a significant evolution of its organizational structures throughout the twentieth and into the twenty-first century, and an expanding substructure of disciplinary foundations significantly influenced this process (Braxton & Hargens, 1996). In particular the growth of scientific and technical knowledge resulted in a proliferation of academic disciplines, which have continued to grow and subdivide. Before 1850 most colleges and universities taught only a few basic fields like classical languages, mathematics, and philosophy; by the end of the twentieth century some colleges and universities were offering students choices from as many as 149 fields of study (Braxton & Hargens, 1996).

The largest and most visible effect of the growth and expansion of disciplines in higher education is the way colleges and universities are functionally organized (e.g., into colleges, schools, and departments) (Faricy, 1974). Disciplinary growth and variation also impact colleges and universities in their exercise of two of their key missions: instruction (Neumann, 2001) and research (Becher, 1994). This study focuses on the impact of disciplinary variation in the area of research. Specifically, within the context of a particular disciplinary classification system (Biglan 1973a, 1973b), the study investigates how disciplinary variation affects dominant research methodologies as represented in articles published in research journals. In this process, the investigation tests the validity of groupings in the Biglan (1973a, 1973b) scheme. Based on the findings, the study discusses the implications of a system of classification of disciplinary variation for the higher education enterprise in the exercise of its research mission.

Rationale for a Disciplinary Classification Scheme

Academic disciplines represent a logical source of differentiation in organizational structure because each discipline possesses some common cognitive or social rationale that

defines its boundaries (Becher & Trowler, 2001; Del Favero, 2003). From the cognitive perspective, the way in which institutions form their substructures or departments is based upon the differing ways in which knowledge is developed and taught across the various disciplines. From the social perspective, disciplinary structures vary based on the social culture that grows around the strength of identity and inclination to collaborate present in the group (Becher & Trowler, 2001). Both the cognitive and the social structures of disciplines illustrate their manifestation as dynamic organizational components of the higher education system. As such, the similarities and differences in the manner that disciplines approach teaching, research, and administration are significant to the historical and future structural organization and function of higher education institutions.

Empirical studies have shown the ways disciplines affect higher education. Faricy (1974) illustrated how disciplines impact organizational departmentalization. Kuh and Whitt (2000) showed the uniqueness of university culture compared to the culture of other formal organizations. Becher (1987) explained the shaping of the academic profession along disciplinary lines in terms of what it means to be an academic. Neumann (2001) found differing approaches to teaching and learning across the disciplines. Kekale (1999) showed how disciplines affect academic leadership at the departmental level. And, Becher (1994) and Biglan (1973b) found varying research practices in different disciplines. All of these studies illustrate the important role that disciplines play in the structure and functioning of higher education organizations, and are representative of attempts over the past 30 years to define and explain the nature of academic disciplines. In particular, scholarly efforts have focused on those characteristics of the disciplines that form the cognitive and social bases of their variations in research, teaching, and administration. (Becher, 1989; Becher & Trowler, 2001; Biglan, 1973a; Lodahl & Gordon, 1972).

Among the various analytical frameworks used to classify academic disciplines, the most predominant are based upon the level of paradigmatic development or the level of consensus within an individual field of study, both of which focus on a cognitive base. To understand what is meant by paradigmatic development, one must turn to Kuhn's (1962, 1970) inquiry into the nature of scientific work and his concept of paradigmatic development. Kuhn (1962, 1970) was interested in the nature of scientific revolutions. He postulated that there were two types of science, normal and revolutionary. Most of the time science moves within its normal established work until it becomes heavily influenced by non-rational procedures or anomalies. Science is then punctuated by intellectually violent revolutions that ultimately change the paradigm. After the revolution, science reestablishes normalcy until another intellectual revolution materializes. Kuhn (1962, 1970) characterized this process as a recurring cycle of pre-paradigmatic, paradigmatic, and revolutionary states. The level of paradigm, then, determines the state of science at any given time.

In the process of his effort to explain the variations in scientific achievement, Kuhn (1962, 1970) laid a framework for consideration of disciplinary variation based upon the level of paradigm development. Later thinkers sought to explain the differences in academic disciplines beyond the sciences based on the level of paradigm development. Further, they sought to explain not only differences within a discipline, but also between the various disciplines (Biglan, 1973a, 1973b; Lodahl & Gordon, 1972). According to this thinking, in contrast to Kuhn's (1962, 1970) idea of paradigmatic revolution, disciplines are considered to be static in their level of paradigm development (i.e., the discipline itself determines the level of paradigmatic development, which then remains constant).

The concept of paradigmatic development is based on the premise that scholars in the different disciplines vary in the levels of consensus they exhibit on issues like theoretical

orientations and research methods (Braxton & Hargens, 1996). Fields like chemistry have well-defined and agreed-upon methods of inquiry and are considered to have high paradigmatic development. Other areas like education, in which bases of knowledge and patterns of inquiry are not as univocal, are described as having low paradigmatic development.

It is important to note that the terms paradigm development and level of consensus used by various authors to describe the nature of a discipline are simply two ways of explaining the same phenomenon. For example, analyses of disciplinary structure utilizing the concept of level of consensus postulate that the disciplines are arranged along a continuum, with well-developed sciences like physics at the one end and social sciences like sociology at the other (Cole, 1983). Analyses utilizing the concept of paradigmatic development also find a range of disciplines from low to high levels of paradigm development (Lodahl & Gordon, 1972). Though the terms are different, each analysis seeks to define and differentiate disciplines based upon how well-defined and tightly-knit are their bases of knowledge and directions of inquiry. For this reason, Del Favero (2003) pointed out that the terms paradigm development and level of consensus can be thought of as interchangeable since they both describe the extent of agreement on the structure of disciplinary inquiry and knowledge production.

Other attempts at classification look more to the social and cultural components of disciplines (Becher, 1989; Becher & Trowler, 2001). This type of analytical framework sees disciplines in the higher education organizational structure as representative of a social construct rooted in distinctive disciplinary cultures. While recognizing the cognitive dimension of disciplinary variation, a socially based model, like that of Becher (1989), seeks to expand beyond paradigmatic consensus and into the influences of the cultural and social context on disciplinary identity. Within the social dimension, Becher (1989) pointed to the level of convergence as a distinguishing feature between disciplines. Convergence refers to the degree of cohesion and

group identity displayed in a particular discipline. A field like mathematics, in which there are common modes of discourse and universal agreement on modes of proof and definition, would be a highly convergent field. Mechanical engineering, which lacks a central core theory or collective view of inquiry, is considered to be a divergent discipline.

The social dimension of disciplines is also a factor affecting the choice of a rationalistic versus a holistic approach to research questions (Becher, 1981; Becher, 1989; Becher & Trowler, 2001). A rationalistic approach is one in which problems are addressed by breaking them into pieces, each to be studied separately, and a large number of researchers focus on a small number of problems; physics as a field epitomizes the rationalistic approach. On the other hand, a holistic approach sees reality as one and indivisible, every part must be seen in the context of the whole, and the ratio of researchers to problems is low. Collaboration and teamwork are more prevalent in holistic disciplines, and most of the social sciences fall into this group (Becher, 1989; Becher & Trowler, 2001).

Among the best-known cognitively-based disciplinary classification schemes is that developed by Biglan (1973a, 1973b). In his landmark studies, Biglan (1973a, 1973b) used multidimensional scaling to analyze data on faculty members' perceptions of the similarity of subject matter in different disciplines. Biglan (1973a) found that these faculty perceptions could be represented in three dimensions: hard/soft, pure/applied, and life/non-life systems. The dimensions involve the degree to which a paradigm exists in the field, the degree of concern with application of disciplinary knowledge, and whether or not the discipline is concerned with life systems. Utilizing the already mentioned concept of paradigmatic development as articulated by Kuhn (1970), Biglan (1973a) appropriated the terminology of hard versus soft disciplines (Storer, 1967) to denominate this variation in fields. Hard disciplines are those in which there is a high degree of paradigmatic consensus, for example chemistry, where the number of elements

and stable chemical processes, as well as the methods of investigating their properties, are commonly agreed upon. Soft disciplines are those whose paradigms are more nebulous, for example philosophy where the bases of philosophical systems are multiple. Pure fields are those in which there is little concern for practical application. For example, English literature, a pure discipline that has little applied focus, is distinguished from engineering, an applied one, which is precisely about practical application of scientific concepts. The distinctiveness of life disciplines is that their subject matter refers to any type of living thing; therefore botany and zoology as well as anthropology are life sciences. Non-life fields are those whose subject matter deals with anything non-organic, for example geology.

Utilizing the results of multidimensional analysis, Biglan (1973a, 1973b) showed that the three characterizing dimensions of disciplines correlate with many other aspects of academic behavior: the degree of social connections within disciplines; commitment to teaching, research, and service; the quantity and type of publishing; and the number of dissertations sponsored. Biglan (1973b) concluded that in those areas in which there is greater existence of a paradigm (hard areas) there is more social connectedness, greater commitment to research, less commitment to teaching, and more publication of journal articles. This is even more apparent in the hard-applied disciplines and somewhat less so but still present in the life (vs. non-life) systems. Biglan (1973b) asserted this perspective on the nature of academic behavior would enlighten the future studies of academic organizations.

The Biglan (1973a, 1973b) classification is one of the more widely accepted models of disciplinary classification because of the number of studies done to empirically validate it. Various researchers have considered factors ranging from citation patterns (Hargens, 1996), faculty salaries and staffing patterns (Muffo & Langston, 1981), to professional success and

research opportunities (Smart & Elton, 1982) as empirical means of validating Biglan's classification.

This study utilizes Biglan's (1973a, 1973b) classification scheme for several reasons. Biglan's classification system possesses significant empirical validation, as mentioned above. Further, the model encompasses the concept of paradigmatic consensus that underlies most schemes of disciplinary classification, including the more expansive cultural schemes (Becher, 1989; Becher & Trowler, 2001). Finally, the Biglan (1973a, 1973b) model is cognitively-based; it is based on the structure and production of knowledge, and this basis seems most logical for a study seeking to validate disciplinary variation on the basis of research methodologies.

Purpose and Significance of the Study

One of the criticisms of disciplinary classification systems, as well as attempts to empirically verify them, is that these studies focus more on what faculty think about their work, rather than what they actually do (Braxton & Hargens, 1996). The Biglan (1973a, 1973b) cognitively based classification system is built upon faculty perceptions about their own work and that of their colleagues in other disciplines. The social and culturally-based taxonomy of disciplines developed by Becher (1989) is also developed as much on faculty interviews as on observation in his comprehensive ethnological study. Empirical validation studies, whether of the cognitive based (Smart & Elton, 1982) or culturally based (Kekale, 1999) classification schemes, also rely heavily on the views of disciplinary members.

Research and research methodology are among the key components reflecting the degree of paradigmatic consensus in a discipline (Becher, 1994; Braxton & Hargens, 1996), and therefore essential to classification models like that of Biglan (1973a, 1973b). Nevertheless, to date no studies have examined research methods across the disciplines as a validation of disciplinary classification. Among other research related activities, research output (Biglan,

1973b), citation patterns in research articles (Hargens, 1996), and sources of research funding (Smart & Elton, 1982) have all been examined in the literature, but disciplinary variations in research methodology have yet to be studied in this context.

This study utilizes preferred disciplinary research methodologies as a means of empirical validation of the Biglan (1973a, 1973b) classification scheme. Using this method, something that members of disciplines actually do (research) was used to question the validity of this disciplinary classification. This is important because research methodology is an activity that is not only core to the research process, but also a key criterion for the paradigmatic element of the classification scheme itself. The choice of research method as the focus of differentiation between disciplines serves to frame the primary research question: Are there significant differences in preferred research methodologies between the disciplines classified according to the Biglan (1973a, 1973b) scheme? The answer to this question helps to determine the usefulness of the Biglan (1973a, 1973b) system as a tool for analyzing disciplinary variation. Beyond the validity of the Biglan (1973a, 1973b) model, the similarity or difference of research approaches across disciplines also has an impact on how higher education organizations structure their academic components as well as the possibilities and capabilities of various kinds of interdisciplinary research efforts.

The finding of significant differences in research methodologies across the disciplines also gives rise to deeper questions about research paradigms and their philosophical underpinnings. These paradigms underlie the varying methodologies. Guba and Lincoln (1988) noted that particular research methods are used in different disciplines but the manner in which they are used varies. This variation in methodology is the result of different underlying paradigms and their corresponding foundational philosophies; for example, different paradigms

have varying views of the nature of reality as either objective or subjective and this affects the use of method.

Guba and Lincoln (1982) found that there were major differences between rationalistic and naturalistic paradigms of inquiry including the logical, ontological, and epistemological foundations of these paradigms, which lead to diverse research methodologies. Teddlie and Tashakkori (in press) expand the contrast to include various modes of inquiry ranging between the extremes of rationalism and empiricism to account for the evidence of at least five distinct paradigms in the behavioral and social sciences, which are also variable on the philosophical foundations cited by Guba and Lincoln (1982).

Assuming that research methodologies across all disciplines are founded philosophically in some research paradigm (Guba & Lincoln, 1988, 2005), deeper questions arise concerning the implications of diverse research methodologies across disciplines. These questions touch upon the very possibility of interdisciplinary research and communication. The implications speak to the possibility of combining research methodologies among disciplines, which are founded in differing philosophical paradigms. Could researchers, founded in particular research paradigms, philosophies, and methodologies communicate and work with each other?

Proponents of the philosophical school of pragmatism assert that the varying methodologies of research paradigms are compatible; they hold that researchers in an individual discipline can utilize methodologies from a mixture of research paradigms (Tashakkori & Teddlie, 2003; Teddlie & Tashakkori, in press). But can researchers from disciplines with diverse philosophical foundations of their research paradigms work together in an interdisciplinary effort? If English professors and physicists never collaborate on a research project, are their ways of thinking based in their disciplinary philosophical paradigms so

dissimilar that they cannot communicate with one another in the organizational and functional structures of a higher education institution?

The increasing interest in social problems, new technologies, and breakthroughs in research has given an increasingly interdisciplinary cast to knowledge production (Klein, 1996). Research efforts in the last quarter of the twentieth century have increasingly crossed disciplinary boundaries in an effort to solve complex problems (Lattuca, 2001). Urban studies, environmental studies, women's studies, and cultural investigations have been named as areas in which interdisciplinary effort has begun to grow (Klein, 1996). These trends highlight the importance of understanding disciplinary variation as a means of increasing dialogue across disciplines in the effort to promote interdisciplinary research.

In the present academic setting, interdisciplinarity is frequently on the agenda, but actually implementing it in an institutional setting can be very difficult (Klein, 1996). The finding of differences or similarities in research methodologies between disciplines is a foundation from which many questions could be studied relative to interdisciplinary research and communication as well as the nature and composition of the organizational structure of multidisciplinary higher education institutions. The answers to these questions may provide a valuable tool in the implementation of interdisciplinary research efforts.

Key Constructs and Research Questions

Biglan's (1973a, 1973b) disciplinary clustering on three dimensions (pure/applied, hard/soft, life/non-life) results in eight classifications: hard/life/pure, hard/non-life/pure, soft/life/pure, soft/non-life/pure, hard/life/applied, hard/non-life/applied, soft/life/applied, and soft/non-life/applied. The groupings and their associated disciplines from the Biglan (1973a, 1973b) study are illustrated in Table 1.1. It is beyond the scope of this project to attempt a validation of the model based on all eight classifications, and so two groups are compared:

soft/life/pure and soft/life/applied. The disciplines these two groups encompass make up most of the behavioral and social sciences (for example, anthropology, sociology, education, and psychology), which possess many similar approaches to research methodology (Tashakkori & Teddlie, 2003). Since these disciplines possess many similar research methods, the finding of significant differences between them carries greater inferential value.

Table 1.1

Biglan's Clustering of Academic Disciplines in Three Dimensions

	Hard		Soft	
	Nonlife	Life	Nonlife	Life
Pure	Astronomy	Botany	English	Anthropology
	Chemistry	Entomology	German	Political Science
	Geology	Microbiology	History	Psychology
	Math	Physiology	Philosophy	Sociology
	Physics	Zoology	Russian	
			Communications	
Applied	Engineering	Agronomy	Accounting	Educational Adm.
	Computer Science	Dairy Science	Finance	Secondary Educ.
	Mech. Engineering	Horticulture	Economics	Special Education
		Ag. Economics		Vo-tech Education

Note. From "Relationships between subject matter characteristics and the structure and output of university departments," by A. Biglan, 1973b, *Journal of Applied Psychology 57(3)*, 207.

Of the three dimensions (hard/soft, pure/applied, life/non-life) in Biglan's (1973a, 1973b) scheme, the distinction between pure and applied is the point of comparison of research

methodologies utilized here. This choice was necessitated by the fact that all of the social and behavioral sciences fall into the soft/life classification. Therefore, this study focuses on the comparison between the pure (e.g., sociology, psychology, anthropology) and the applied (e.g., educational administration, secondary education, vocational education) disciplinary groupings in the soft/life category of the Biglan (1973a, 1973b) classification system.

Empirical research in the behavioral and social sciences normally utilizes one of three accepted methodologies: quantitative, qualitative, or mixed methods (Johnson & Christensen, 2004; Tashakkori & Teddlie, 2003). These three variations therefore provide a basis for differentiating the preferred methods in each of the disciplinary groups. Thus the basic research question can be precisely stated as follows:

> Research Question # 1: Are there significant differences in the use of quantitative, qualitative, and mixed methodologies between pure and applied groups of disciplines in the soft/life groups of the Biglan classification?

Quantitative, qualitative, and mixed methodologies are, therefore, the primary variables upon which the pure and applied groups of disciplines in the soft/life classification of Biglan (1973a, 1973b) were compared.

Quantitative, qualitative, and mixed research methodologies all possess various common components such as research design (e.g., experimental, correlational, case study), sampling methods (e.g., probability or purposeful), data collection methods (e.g., questionnaires, observation, tests), and data analysis techniques (e.g., t-tests, content analysis) (Creswell, 1998, 2002; Johnson & Christensen, 2004; Tashakkori & Teddlie, 2003). Analysis of preferred research methodologies also allows for comparison of their various components across the disciplines. Such comparison leads to a second research question:

Research Question # 2: What are the frequencies of use of the various methodological components in each of the disciplinary groups in question, and are there significant differences in the use of these components between the groups?

The answer to this question makes a finer and more technical point regarding any differences found between the basic methodological groupings (quantitative, qualitative, and mixed). A high frequency of quantitative methods across both pure and applied disciplines, for example, may nonetheless be a source of differentiation based on preferred use of the various research designs and other constituent components.

The disciplinary classification system being used (Biglan, 1973a, 1973b) is largely based in paradigmatic consensus. Research paradigms have a basis in various philosophical positions about reality and how we understand it (Teddlie & Tashakkori, in press). These philosophically based paradigms, which have been classified as positivism, postpositivism, constructivism, and critical theory (Creswell & Miller, 1997; Guba & Lincoln, 2005; Ponterotto, 2005; Teddlie & Tashakkori, in press), are the ways of understanding and thinking that give rise to research methods (Guba & Lincoln, 1988, 2005). Therefore, it makes sense, in the context of a study comparing research methodologies across disciplinary groupings, to ask if there is also evidence of differences in fundamental philosophical paradigms across these groups. This inquiry gives rise to a third research question:

Research Question # 3: Is there evidence of differences in the underlying philosophical paradigms of disciplinary groups in the Biglan classification? If so, are there significant differences in preferred paradigms between the groups?

Such evidence is to be discovered in the inference that the choice of a particular methodology makes with regard to underlying an underlying paradigm; for example, the choice of quantitative research methods, utilizing exclusively quantitative components strongly infers a postpositivist

paradigm (Creswell, 2003; Guba & Lincoln, 1988; Teddlie & Tashakkori, in press). Evidence is also found in the direct statements of researchers about the philosophical foundations of their research approach.

The Research Plan

The research plan has its inspiration in two studies that analyzed the contents of research articles in education journals. The first is a dissertation (Niglas, 2004) that studied the combined use of quantitative and qualitative research methods (mixed methods) in education journals. Niglas (2004) provided a rationale for utilizing journal articles to compare research methods within a discipline. The technique for the present study extends this rationale, utilizing journal articles to compare research methods across disciplines.

The second influence for the approach is a study that compared the research methods utilized in three journals of higher education (Hutchinson & Lovell, 2004). Hutchinson and Lovell (2004) were more focused on the particular components of research methods utilized across three key higher education journals, and provided a detailed format for content analysis of the journal articles. This format was adapted into a code sheet utilized for analyzing research articles of various disciplines in the study.

As mentioned earlier, the scope of the study does not allow for a comparison of all the groups in the Biglan (1973a, 1973b) classification system, so only the soft/life/pure and soft/life/applied groups are the subjects of study. Further, it is also not possible in a limited study to compare all the disciplines (at least four in each group) that have been classified as belonging to the group (Biglan, 1973a, 1973b; Malaney, 1986; Stoecker, 1993); therefore, two disciplines from each of the groups to be compared were chosen for the study. Sociology and Psychology were chosen to represent the soft/life/pure group, and Education and Nursing were the disciplines chosen to represent the soft/life/applied group. Therefore, the study specifically

studied the differences in preferred methods between Sociology and Psychology as a group, and Education and Nursing representing a group, each in the Biglan (1973a, 1973b) scheme.

The methodology is basically quantitative (in sampling, data analysis, and data inference), but also involves qualitative data collection (coding of research articles). The qualitative data collected was then quantitized (changed into numerical data) for quantitative analysis. The research design, then, can be classified as a quasi-mixed mono-strand design (Teddlie & Tashakkori, 2006). Specifically, it has one strand of research (hence mono-strand), which utilizes predominately quantitative methods to answer the research questions, but which mixes methods in a single stage of the research process (data collection with a qualitative instrument), and so can be termed a quasi-mixed design (Teddlie & Tashakkori, 2006).

Selection of journals representative of research in each of the chosen disciplines was made utilizing citations and impact factor as reported in *Journal Citation Reports* (2005). A simple multiple of citations and impact factor (number of citations times impact factor) yielded the top five journals in each discipline, and 30 articles were randomly selected from each. This yielded a total of 150 articles from each discipline and 300 from each Biglan (1973a, 1973b) group for a total of 600, a sample size which fulfills standard power and effect size requirements (Aron, Aron, & Coups, 2006; Cohen, 1988).

The research articles chosen were subjected to content analysis based on predetermined categories detailing research methodology. These categories, which were developed following Hutchinson and Lovell's (2004) model, detail the basic type of research methodology (quantitative, qualitative, or mixed), as well as various components of those methodologies (e.g., research design, sampling method, data analysis method, and data selection methods), including the underlying research paradigm. The qualitative data thus collected is presented as quantitative

frequencies of each methodology in each group as well as the frequencies of the particular research designs, paradigms, and other components in each group.

Chi-Square analysis was used to compare the categorical groups of pure/soft/life and applied/soft/life across the frequencies of quantitative, qualitative, or mixed methodologies, as well as the frequency of other research methodological components and underlying paradigms. Findings of significant differences between the two groups in any of the frequencies measured are considered evidence for the validity of the Biglan (1973a, 1973b) classification system.

Based on the findings of the statistical analysis and founded in the relevant literature reviewed in the study, implications are drawn for higher education. The primary finding is for the validity of the Biglan (1973a, 1973b) system. Biglan's (1973a, 1973b) scheme is validated once again through the study, and as such is further validated as a tool for higher education to analyze disciplinary considerations particularly relative to research. Also, based on the findings, further implications are drawn for the possibilities of interdisciplinary research based on similarities or differences found between the disciplines either individually or in the various groups of a classification system. Further, again considering the literature and the findings of the study, the import of research paradigms for disciplinary and interdisciplinary research in higher education is also considered.

Finally, directions for future research in the area are indicated. The study is only a small part of a much larger research project. The value of continuing in the larger project, as well as other possibilities for research in the area, conclude the study.

CHAPTER 2: REVIEW OF THE LITERATURE

Areas of Review

This study is founded in three areas of theory and research. The first area of literature to be reviewed concerns the understanding of academic disciplines as distinct forms of teaching, learning, and research, each with its own distinct culture and organization in the higher education enterprise. In this vein, classification systems and taxonomies that group discipline by similar characteristics will be considered, and some rationale for choice of the Biglan (1973a, 1973b) model for the study will be provided.

The second area considers the empirical verification of classification systems, in particular the Biglan (1973a, 1973b) scheme, which is the conceptual frame for all the research questions. The study, in the first research question, asks if the Biglan (1973a, 1973b) system can be verified on the basis of preferred research methods. The verification process also highlights the practical implications of disciplinary variation on higher education, and serves as a partial basis for ultimate conclusions about the results of the study.

The third area deals with research methodology, and in particular research methods commonly employed in the social and behavioral sciences that are the subject of the study in the form two disciplinary groupings in the Biglan (1973a, 1973b) classification system. From these methodologies come the rationale and components that are used in the code sheet developed for this study to analyze preferred research methods in the disciplinary groups on the basis of quantitative, qualitative, and mixed methods. Therefore, a short review of the development of research methods in the social and behavioral sciences is presented.

In order to understand the development of these research methodologies, the paradigmatic basis of research methods, and the strength of the relationship between research paradigms and research methods must also be considered. This literature provides the

conceptual underpinning of the conclusions to be drawn from the third research question that asks if there are differences in underlying paradigms across the groups. The major elements of these paradigmatic and methodological issues will be briefly touched upon in this review and will be the subject of further elaboration in the operational definitions of research paradigms developed in Chapter 3.

Understanding Academic Disciplines

Toward a Definition of Discipline

Disciplines are arguably the lifeblood of higher education (Becher, 1994), and within academic institutions, they provide higher education's main organizing base and social framework (Clark, 1983). As such, and in view of the study, a definition of academic or intellectual disciplines is an important starting point.

Swoboda (1979) traced the history of the development of disciplinarity all the way from its origins in the development of universities in the Middle Ages. Most relevant to this study, Swoboda (1979) points out that what we now call academic disciplines are mainly a product of the nineteenth century, and their development is linked to the evolution of the natural sciences when the distinction of the sciences as pure or applied came into being. Flexner (1979) followed the same historical development of disciplines, but with a focus on their influence on curriculum. The historical surveys and analyses by both Swoboda (1979) and Flexner (1979) testify to the fundamental role of disciplinarity in the shaping of the educational institutions and academic professions from their roots to the form in which we know them today.

Smart, Feldman, and Ethington (2000) refined the historical view of academic disciplines by looking at the evolution of the American academic profession in particular. They saw the American form of the academic profession as having been influenced by three European models, which explain much of the diversity currently associated with different types of academic

disciplines. The first, the English model, emphasized mental discipline with the goal of providing a common social, moral and intellectual experience. The second, the Scottish model, emphasized practical subjects and viewed the professor as the dispenser of knowledge. Third was the German model with its emphasis on scientific training and research to expand knowledge. These three models influenced the types of higher educational institutions that have developed in this country and the academic disciplines that flourish in them: the English model is apparent in liberal arts colleges; the Scottish model is evident in land grant universities and community colleges; the Germanic model thrives in large research universities (Smart, Feldman, & Ethington, 2000). In each of these types of institutions, academic disciplines play a central role in shaping the careers of the faculty whose professions are dominated by the disciplinary activities peculiar to their type of institution.

Even with a long history of development, the theoretical concept of an academic discipline remains elusive. Kockelmans' (1979) attempt to define discipline goes all the way back through the course of history to the Middle Ages when Boethius introduced distinctions in the ancient Greek and Roman systems of *quadrivium* and *trivium,* segregating them as the *disciplinae liberales* (arithmetic, geometry, astronomy, and music) and the *artes liberales* (grammar, rhetoric and dialectic). Kockelmans (1979) then progressed to the later Middle Ages when *disciplina* had already acquired four related meanings: the seven liberal arts, any subject matter taught in a university, branches of knowledge proceeding from the liberal arts, and science. Following the development of the concept through the centuries much along the lines of Swoboda (1979), Kockelmans' (1979) definition of discipline in the present is:

> A branch of learning or a field of study characterized by a body of intersubjectively acceptable knowledge, pertaining to a well-defined realm of entities, systematically established on the basis of generally accepted principles with the help of methodical rules or procedures. (p. 127)

Robles (1998), attempting to pin down a definition of discipline that is not quite as dense as the one just cited, suggested a discipline is "a recognized branch or segment of knowledge within rational learning with certain generally agreed upon canons or standards," or "a discrete subject and its characteristic regimen of investigation and analysis," or most simply put, "for all intents and purposes on any one campus, discipline = department" (pp. 4-5).

Often the definition of an academic discipline is dependent on the nature of inquiry. It has been variously defined as founded on a base of knowledge (Kockelmans, 1979), representing the beliefs and behaviors of its practitioners (Becher, 1994; Del Favero, 2003; Smart, Feldman, & Ethington, 2000), viewed from its situation in the structure of academic institutions (Clark, 1983, Del Favero, 2003), looked at as a method of inquiry or research (Del Favero, 2003; Robles, 1998), or studied as a conceptual structure (Biglan, 1973a, 1973b; Becher, 1989).

For the purpose of this study, the definition of Del Favero (2003), which builds upon the foundational research of Lodahl and Beyer (1972) and Becher (1989), is proposed. Academic disciplines are defined as providing:

> The structure of knowledge in which faculty members are trained and socialized; carry out tasks of teaching, research, and administration; and produce research and educational output. Disciplinary worlds are considered separate and distinct cultures that exert varying influences on scholarly behaviors as well as on the structure of higher education. (Del Favero, 2003, p. 10)

This definition includes as a key component the production of research, which is the subject of the study. The definition also stresses the influence of disciplinarity on teaching, the social culture of academics, and the structure of higher education, which are all impacted by differences in academic disciplines as suggested in the Biglan (1973a, 1973b) scheme.

Frameworks for Classifying Disciplines

Braxton and Hargens (1996) presented a thorough review of various conceptual frameworks developed to study disciplinary differences over the past 40 years providing a

summary of six main types of classification systems that have evolved: Kuhn and paradigmatic development, codification, consensus, organizational structure, the Becher cultural view, and the Biglan model. Del Favero (2003) organized the major approaches in five groups (not touching the organizational structure approach). The scholarship of Braxton and Hargens (1996) and Del Favero (2003) is incorporated throughout the following summary.

It should be noted that many authors use the terms *field* and *discipline* with a variety of meanings. In some cases, fields are meant to represent broad categories which encompass many disciplines (Braxton & Hargens, 1996). In other cases, fields are considered to be subdivisions of disciplines (Becher 1994). Many authors use the terms interchangeably to represent the organizational divisions of academic subjects (Braxton & Hargens, 1996). Throughout this text the terms are also used interchangeably to represent academic disciplines as defined above (Del Favero, 2003).

Kuhn and Paradigmatic Development

Modern interest in disciplinary organization began about 40 years ago with the work of Kuhn (1962) and his ideas about the nature of scientific study. Kuhn's (1962, 1970) work has already been referenced in the introduction to this study and is reiterated here. Kuhn (1962, 1970) was primarily concerned with the nature of scientific work. He postulated that there were two types of science, normal and revolutionary. Most of the time science moves within its normal established work, its paradigm. The paradigm, according to Kuhn (1962, 1970), is a kind of ordering and investigating of knowledge well established in the science. This paradigm continues to be the model of scientific study until it becomes heavily influenced by non-rational procedures or anomalies. It is then punctuated by intellectually violent revolutions that ultimately change the paradigm. After the revolution, science reestablishes normalcy in a new paradigm until another intellectual revolution materializes. Kuhn (1962, 1970) characterized this

process as a recurring cycle of pre-paradigmatic, paradigmatic, and revolutionary states. The level of paradigm, then, determines the state of science at any given time.

In the effort to explain variations in the level of scientific achievement, Kuhn (1962, 1970) laid a framework for consideration of variations in not only scientific but all other disciplines based upon the level of paradigm development. Fields with well-developed paradigms such as physics are thought to have clear ways of defining, ordering, and investigating knowledge; fields such as education and sociology would be considered pre-paradigmatic according to Kuhn (1962, 1970), and characterized by a high level of disagreement about the nature of knowledge and methods of inquiry in the field (Del Favero, 2003).

Storer (1967, 1972) was the first to use the terms "hard-soft" and "pure-applied" to explain disciplinary variations. Storer (1967, 1972) considered the hard-soft distinction reflective of the levels of paradigmatic development suggested by Kuhn (1962), with hard disciplines having high levels of paradigmatic development and soft disciplines having less or being pre-paradigmatic (Braxton & Hargens, 1996; Del Favero, 2003). Storer (1976, 1972) further claimed many fields distinguished themselves by the pure or applied nature of their approach to research (Braxton & Hargens, 1996).

Consensus

Lodahl and Gordon (1972) suggested that the concept of paradigm development (Kuhn, 1962, 1970) was a predictor of disciplinary differences, based on a study that used data from 80 graduate departments. Lodahl and Gordon's (1972) argument was that the degree of consensus or sharing of beliefs within a scientific field about theory, methodology, techniques, and problems represents a paradigm that should make research technologies predictable. In this way, Lodahl and Gordon (1972) linked the concepts of consensus and paradigm development.

Hagstrom (1964, 1965) and Hargens (1975) took up the question consensus and disciplinary differences in terms of sociological concepts (Braxton & Hargens, 1996). Hagstrom (1964, 1965) focused on consensus among disciplinary practitioners concerning appropriate research topics and methods; and Hargens (1975) also considered consensus as an essential element of social solidarity in scholarly disciplines (Braxton & Hargens, 1996). Del Favero (2003) defined consensus as the degree of unity of mind in a discipline about theory, methods, techniques, and problems. She delineated the indicators of consensus in a field as

> Absorption of the same technical literature, similar education and professional initiation, a cohesiveness in the community that promotes relatively full communication and unanimous professional judgments on all scientific matters, and a shared set of goals, including training professors. Researchers commonly attribute high levels of consensus to the physical sciences, low levels to the social sciences, and even lower levels to the humanities. (p.11)

Even though both Braxton and Hargens (1996) and Del Favero (2003) outlined the conceptual framework of consensus as a separate development in the history of the study of academic disciplines, both suggested that the ideas of paradigm development and consensus are interrelated to the point of being interchangeable. Braxton and Hargens (1996) pointed out that the originators of the ideas of consensus distinguishing academic fields (Hagstrom, 1964, 1965; Hargens, 1975) explicitly compare their notions to the pre-paradigmatic, paradigmatic, and revolutionary stages of science professed by Kuhn (1962, 1970). Del Favero (2003) went further and stated that consensus is the core of the paradigm development concept. She argued that the terms paradigm development and consensus are even interchangeable because "they describe a common dimension of disciplinary fields---the extent of agreement on the structure of inquiry and the knowledge it produces" (p. 11).

Codification

Both Del Favero (2003) and Braxton and Hargens (1996) distinguished a third attempt at classifying disciplines that they termed codification. Codification represents the consolidation of

empirical knowledge into succinct and interdependent theoretical formulations. Codification describes a field's body of knowledge as opposed to the behavioral dimension of scholarly activity as described by the consensus models (Braxton & Hargens, 1996; Del Favero, 2003). The classic studies on codification of fields are those of Zuckerman and Merton (1971, 1972). The first study showed that average journal rejection rates varied substantially across disciplines, and that the pattern of the variation was due, at least in part, to agreement on standards of scholarship (i.e., the level of codification) (Zuckerman & Merton, 1971; Braxton & Hargens, 1996). In the second study, Zuckerman and Merton (1972) argued that young scholars obtained scholarly recognition more quickly in highly codified fields than in those with lower levels.

Zuckerman and Merton (1972) noted that codification as they described it bore a resemblance to Storer's (1967) distinction between hard and soft fields. This similarity, as well as the fact codification is a characteristic of a field's body of knowledge rather than a behavioral dimension of scholarly activity, has led to little further research utilizing this concept of disciplinary differentiation (Braxton & Hargens, 1996). Indeed, Del Favero (2003) suggested that use of the codification framework has been subsumed in the use of the consensus concept because consensus, or level of agreement, is a function of codification according to Zuckerman and Merton's (1971, 1972) conclusions.

Approaches Based on Organizational Structure

Braxton and Hargens (1996) highlighted another approach to classifying disciplines that relies on sociological theory and its impact on the organizational culture of higher education. Collins (1975) argued that neither the hard-soft nor the paradigm-nonparadigm distinctions captured the full range of disciplinary differences in organizational structure and suggested there were two new dimensions: the level of task uncertainty and the level of coordination of needs. The former refers to the ability of a field's members to anticipate the results of their activities,

and is usually high when activities are strongly guided by a paradigm. The latter refers to the degree to which a field's members rely on each other for success, and is normally high when members' reliance on each other is strong (Braxton & Hargens, 1996). Since a field could change its position on each dimension, Collins (1975) suggested a fourfold typology of disciplines: high task uncertainty-high coordination of needs, high task uncertainty-low coordination of needs, low task uncertainty-high coordination of needs, and low task uncertainty and low coordination of needs.

Whitely (1984) took the fourfold typology of Collins (1975) and added two dichotomous sub-dimensions: technical versus strategic task uncertainty, and functional versus strategic mutual dependence. The result was a system with 16 types of disciplines. Fuchs (1992) chose a simpler approach, and returned to Collins (1975) fourfold typology, but added various field characteristics like research practices, cognitive styles, and epistemological perspectives. Fuchs (1992) suggested that scholarly communities' social structural characteristics (i.e., those just mentioned) influence their intellectual characteristics (Braxton & Hargens, 1996). Fuchs (1992), however, did not establish a formal taxonomy of dimensions to classify groups of disciplines. None of the organizational structure approaches have proved practicable for empirical studies and verification (Braxton & Hargens, 1996).

Becher and the Culture of Disciplines

Tony Becher is perhaps the only higher education researcher to have focused the majority of his scholarly efforts over the course of his career on the nature of academic disciplines (Becher, 1989). Becher's research began in 1981 with a study that outlined his inquiry into disciplinarity from the perspective of culture (Becher, 1981). Six disciplines (physics, history, biology, sociology, mechanical engineering, and law) were examined and commonalities and contrasts both within these disciplines as well as between them were discovered. In this

empirical study, Becher interviewed 126 academics in England and the United States. A minimum of 20 academics per discipline in three or four departments for each discipline were interviewed. In his findings, Becher (1981) introduced the metaphor of *urban* and *rural* research styles to express the fundamental cultural difference between disciplines. Urban disciplines favor a rationalistic posture in which problems are approached by breaking them into pieces, each to be studied separately. Rural disciplines take a holistic approach in which reality is one and indivisible; every part must be seen in the context of the whole. Becher's (1981) article represented a significant milestone (perhaps the first) in the connection between academic disciplines and the culture of higher education organizations, and laid the groundwork for over 20 years of further research by Becher along these lines.

Becher (1984) expanded upon the results of his previous empirical research (1981) with an exploration of the concept of culture and its applicability to academic life. Becher (1984) defined culture as a shared way of thinking and a collective manner of behaving, with social and environmental factors that affect culture intrinsically and extrinsically. Becher (1984) further examined epistemology by analyzing the nature of knowledge and its impact on academic cultures. In particular, Becher (1984) suggested that the structure and form of knowledge in specific disciplines is characteristic of their culture.

Becher (1987) expanded his cultural concepts in an examination of the culture of academic disciplines as a shaping force in the academic profession. Drawing on the prior research studies of Biglan (1973a, 1973b) and Lodahl and Gordon (1972), Becher (1987) put disciplines into four groups: hard-pure, soft-pure, hard-applied, and soft-applied. These four groupings were further elaborated on the basis of two other distinctions: the nature of knowledge and the nature of the disciplinary culture. The resulting taxonomy has three dimensions: group, nature of knowledge, and nature of culture. The four groups are elucidated respectively as: hard-

pure, cumulative, competitive; soft-pure, reiterative, individualistic; hard-applied, purposive, entrepreneurial; soft-applied, functional, outward-looking. Becher (1987) suggested these four groupings apply to the academic profession in four areas: recruitment and initiation, social interaction within a field, the type and degree of specialization within the field, and the modes of change and mobility within and without the field.

Becher's (1989) *tour de force* on the topic of the culture of academic disciplines is his book *Tribes and Territories: Intellectual Enquiry and the Cultures of Disciplines*. The empirical data consisted of his original research in 1981 expanded to include 12 disciplines and 221 academics in the United States and England. Becher (1989) used *tribes* as the descriptive to designate academic disciplines, highlighting the cultural foundation. The culture of a discipline according to its members' intellectual identity and organization of their professional lives constitutes the tribe. The boundaries of a field of study defined against other disciplines make up the territory of the tribe. The tribes can be seen as a cognitive dimension of disciplinary culture that includes a continuum along the hard to soft, and pure to applied dimensions developed by Biglan (1973b).

The *territory* of the tribes exists as a social dimension in which there is a convergent-divergent continuum (Becher, 1989). In convergent disciplines there is a much stronger sense of cohesion and identity among the group and its boundaries are consequently much better defined. Divergent disciplines differ about the nature of their field and their territories are not so well defined since they show a propensity to adapt across boundaries from other disciplines.

Becher (1989) also described the territory as a continuum of *urban* and *rural* research styles. The urban style favors a rationalistic approach in which problems are addressed by breaking them into pieces, each to be studied separately, and a large number of researchers focus on a small number of problems. Rural style takes a holistic approach in which reality is one and

indivisible, every part must be seen in the context of the whole, and the ratio of researchers to problems is low. Collaboration and teamwork are seen as more prevalent in urban activity than in rural. Urban researchers also have a much greater need for communication among their group than those in the rural disciplines where the pace is often much more relaxed.

Combining the hard-soft and pure-applied continuums of the cognitive dimension and the convergent-divergent and urban-rural continuums of the social dimension, Becher (1989) developed a taxonomy for differentiating disciplines in eight categories. Becher never graphically represented this taxonomy. Utilizing preliminary work done by Kekale (2001) on a model of the taxonomy with four disciplines, a table was developed with placement along the various continuums was developed using Becher and Trowler's (2001) work on twelve disciplines and is shown in Table 2.1.

Much of the basis of the Becher's (1989) book is from his earlier work, but he delved into much more detail about the four groupings highlighting overlaps and commonalities among disciplines and the aspects of community life within them. Also elaborated were the patterns of communication in and among disciplines. Becher (1989) suggested some implications of the cultural study of discipline for theory and practice. In particular, Becher (1989) proposed that the study of disciplinary differences has yet to find a vocabulary that enables academics in different fields to better understand each other, and hence benefit the higher education enterprise.

Becher's (1989) work was a watershed not only in the study of disciplinary cultures, but it is perhaps the most comprehensive empirical and conceptual treatise on the application to and implications of culture at any level in higher education. It serves as a model for much of the study of the influences of disciplinary variations on the culture of higher education at various levels of institutional organization (Braxton & Hargens, 1996).

Table 2.1

Becher's Taxonomy of Disciplinary Cultures

Cognitive Dimension

Hard ⟷ **Soft**

Physics	Biology	History
Chemistry	Mechanical Engineering	Modern Languages
Pharmacy	Economics	Law
Mathematics	Geography	Sociology

Pure ⟷ **Applied**

Physics		Mechanical Engineering
Sociology	Chemistry	Law
	Economics	Pharmacy
Biology		
Mathematics	Geography	
History	Modern Languages	

Social Dimension

Convergent ⟷ **Divergent**

Physics	Biology	Modern Languages
History	Law	Sociology
Mathematics	Chemistry	Mechanical Engineering
Economics		Pharmacy Geography

Urban ⟷ **Rural**

Physics	Mathematics	Chemistry	History
		Biology	Economics
		Pharmacy	Sociology
		Mechanical Engineering	Geography
			Modern Languages
			Law

Note: Adapted from: *Academic Tribes and Territories (2nd ed.),* by T. Becher and P. Trowler, 2001.

It is a testimony to the value and significance of Becher's (1989) earlier work that the text was revised and updated (Becher & Trowler, 2001). The purpose of the revised edition (Becher & Trowler, 2001) was updating Becher's (1989) classic text in light of the many changes in higher education over the decade that had elapsed since the book was written. Becher & Trowler

2001) moved beyond Becher's (1989) first edition focus on elite universities and the research role to examine academic cultures in lower status institutions internationally and to place a new emphasis on issues of gender and ethnicity. In addition to the original ethnographical research done by Becher (1981, 1989), two independent studies were added (Trowler, 1998; Trowler & Knight, 1999). One (Trowler, 1998) was on 50 academics in 30 disciplines that included observation over a five year period at an English university. The other (Trowler & Knight, 1999) looked at 24 new academics in five disciplines at 10 Canadian and English universities.

Forces affecting the structure of higher education both from within and without academe had shifted the influence of academic disciplines. Becher and Trowler (2001) took the view that the cultures of academic disciplines now exert less overall influence on organizational structures than in the past. The second edition of *Academic Tribes and Territories* (Becher & Trowler, 2001) sought to situate that influence in the new geography of higher education in the new millennium. This contextualizing of Becher's (1989) original contribution into the present environment of higher education makes the work (Becher and Trowler, 2001) an even more valuable tool in the study of organizational structures for researchers today.

As intriguing and sophisticated as Becher's taxonomy (Becher, 1989; Becher & Trowler, 2001) is, it is not the ideal choice for study to validate a disciplinary classification system. This is the case for two reasons. First, Becher's research (Becher 1981; 1984; 1987; 1989) was primarily aimed at generating theoretical categories rather than formally testing his conceptual classification system (Braxton & Hargens, 1996). Becher (1994) hypothesized why such research is not presently conducted: the great amount of ethnographic detail in such study involves hard, painstaking work. Secondly, Becher's taxonomy (see Table 2.1) does not produce clearly defined groupings of disciplines that can be easily compared in an empirical verification study using measures of statistical difference.

The Biglan Studies

Two seminal articles by Biglan (1973a, 1973b) brought the concept of disciplinary differences into higher education research. Unlike previous studies into the nature of academic disciplines and classification theories, Biglan's (1973a, 1973b) findings were introduced to researchers in higher education in articles by Smart and Elton (1975, 1982), Bayer (1987), and Braxton & Hargens (1996). In a study that was actually meant to be a psychological analysis, Biglan (1973a) launched a line of research into the nature of disciplinary differences, particularly in the investigation higher education organization (Braxton & Hargens, 1996).

Biglan (1973a) examined the differences in subject matter in academic disciplines looking for dimensions that would distinguish paradigmatic and non-paradigmatic fields (Kuhn, 1960, 1972), as well as the level of practical application. Biglan (1973a) used multidimensional scaling to analyze data on faculty members' perceptions of the similarity of subject matter in different disciplines. One hundred eighty-six faculty members at the University of Illinois judged 36 areas, and the scaling was replicated at a small liberal arts college using 70 faculty members judging all the areas in which that college offered courses. It was found that these faculty perceptions could be represented in three dimensions: hard/soft, pure/applied, and life/nonlife systems.

Biglan's (1973a) conclusion was that these three dimensions appear to characterize the subject matter of academic areas in most institutions. The dimensions involve the degree to which a paradigm exists (hard or soft), the degree of concern with application (pure or applied), and the level of concern with life systems (life or nonlife). In terms of the amount of variance explained, Biglan (1973a) found the strongest dimension to be the hard/soft. Biglan (1973a) also noted that this hard/soft dimension was most akin to Kuhn's (1960, 1972) paradigmatic and non-paradigmatic distinction of fields. The second strongest dimension was the pure/applied

distinction, and the weakest was the life/nonlife. Biglan (1973a) thought all three characteristics should have a potentially important effect on departmental output as well as provide a useful framework for studying the cognitive style of scholars in different disciplines. Biglan's (1973a) clustering of academic disciplines along the three dimensions is illustrated in Table 1.1.

Biglan realized his findings (1973a) had implications beyond just faculty perceptions of their field. He followed up with a parallel study to illustrate some implications. Utilizing the results of his multidimensional analysis, Biglan (1973b) showed that the three characterizing dimensions of disciplines correlate with many other aspects of academic behavior: the degree of social connections within disciplines; commitment to teaching, research, and service; the quantity and type of publishing; and the number of dissertations sponsored. Biglan (1973b) concluded that in those areas in which there is the existence of a paradigm (hard areas) there is more social connectedness, greater commitment to research, less commitment to teaching, and more publication of journal articles. These characteristics are even more apparent in the hard/applied disciplines and somewhat less so but still present in the hard/life disciplines. Where there was less of a disciplinary paradigm (soft areas), Biglan (1973b) found the disciplines to have inverse characteristics to the high paradigm groups.

Choosing the Biglan Model

Braxton and Hargens (1996) echo Clark (1987a) when they suggested that:

> Given the widespread acknowledgment that disciplines exhibit substantial organizational and intellectual differences and exert pervasive influence on their members…researchers often need to control or statistically remove disciplinary effects when they analyze data for higher education faculty in different departments. (Braxton & Hargens, 1996, p. 6)

In this way, Braxton and Hargens (1996) and Clark (1984, 1987a, 1987b) underscored the relevance of a disciplinary typology or classification system for higher education organizational research. Braxton and Hargens (1996) further indicated that most empirical work done thus far on disciplinary classification schemes fall in one of three areas: the Biglan model, the paradigm

development concept, and the scholarly consensus dimension; and they further point out that the paradigm development concept is incorporated in the Biglan model. Further, the Biglan (1973a, 1973b) model provides clearly defined, easily discernable groupings of disciplines, unlike those of Becher (1989), for example, which places disciplines on a continuum without clear boundaries. The Biglan (1973a, 1973b) model has also been the subject of many more empirical studies (validating the Biglan groupings in whole or in part) than the other two schemes (paradigm development and scholarly consensus). These facts provide a strong rationale for the selection of the Biglan model to test for validation in the area of preferred research methods to answer the research questions in this study.

Braxton and Hargens (1996) also referenced the work of Hargens and Kelly-Wilson (1994) in support of the contention that all three of the major classification concepts "seem to be treating phenomena that are closely related, if not the same" (Braxton & Hargens, 1996, p. 9). Hargens and Kelly-Wilson (1994) compared the correlation between Biglan's (1973a, 1973b) hard/soft dichotomy and four other disciplinary measures (two paradigm development measures, a measure of consensus, and discipline-specific journal rejection rates), finding a correlation coefficient of .74. Hargens and Kelly-Wilson (1994) suggested that all five measures tapped into the same underlying dimensions of disciplinary variation. Considering this, and the large amount of empirical validation otherwise done on the Biglan model, it presents a strong choice for use as a model in comparing the differences in preferred research methods across disciplines.

Empirical Studies into the Validity of Disciplinary Classification Schemes

Based on the review of Braxton and Hargens (1996) and a further review of journal databases performed currently for the present study, empirical studies seeking to validate disciplinary classification models, other than for the Biglan model, are not plentiful and only the Becher taxonomy and the Biglan model have been the subject of the most recent studies over the

last decade. In many cases, the original research done in developing a model is the most comprehensive work done to validate the model. For example, Zuckerman and Merton's (1971, 1972) original work remains the major source of validation for the codification model they proposed. Further, most of Becher's work (Becher, 1989; Becher and Trowler, 2001) was done in the development of a taxonomy rather than explicitly in validating it through varied empirical designs. Nonetheless, the following sections highlight the more significant empirical work done to verify the five classification systems discussed above, with due emphasis on the Biglan (1973a, 1973b) model.

Paradigmatic Development

Most research about paradigm development is based on Lodahl and Gordon's (1972) work, which showed the influence of paradigmatic development on disciplinary variation. Lodahl and Gordon (1972) developed 16 hypotheses about how variation in paradigm development is seen in faculty teaching and research. In their 1972 study, physicists and chemists were shown to possess high paradigm development, while sociologists and political scientists displayed low paradigm development. The high paradigm fields had higher levels of consensus about content and were more prone to collaboration in research than low paradigm fields. The level of innovation in a field and the differentiation of a field into sub-disciplines were also predicted by degree of paradigm development, with more differentiation apparent in fields with higher paradigm development. Lodahl and Gordon (1972) concluded that there are differences between disciplines that go to the heart of teaching and research; and they argue that university structure and problems, or any attempt to deal with them, must take into account the intimate relations between the structure of knowledge in different fields and the different styles in which university departments operate.

The work on the paradigmatic development model following upon Lodahl and Gordon (1972) to falls into three categories: those concerning the disciplinary community, the academic institution, and the individual (Braxton and Hargens, 1996). Looking into the disciplinary community, studies examined variation in journal editorial boards (Yoels, 1974), determinants of publication outcomes (Pfeffer, Leong, & Strehl, 1977), and differences in editorial practices (Beyer, 1978). On the institutional level, studies examined differences in degree requirements (Thompson & Brewster, 1978) and departmental structure (Neumann & Boris, 1978; Pfeffer & Moore, 1980). At the individual level, differences between types of publications (books or journal articles) across disciplines have been examined (Neumann, 1977). Braxton and Hargens (1996) noted that all the studies mentioned found some support for the concept of paradigmatic differences differentiating disciplines. Some research, for example Beyer (1978) and Neumann (1977), found supporting as well as conflicting findings with regard to the validity of the paradigmatic development model.

All the empirical research reviewed in paradigmatic development area has examined only differences between high and low paradigmatic development in disciplines, and beyond this distinction do not attempt to create a taxonomy or classification scheme to further segregate groups of disciplines. Also, after the mid-1980s (Bresser, 1984), only the work of Braxton (1989, 1990) appears to carry on a peripheral attempt to further study discipline differences solely based on high versus low paradigmatic development. Further studies including the concept of paradigmatic development make it a part of multiple elements in schemes like those of the Biglan (1973a, 1973b) model or the Becher (1989) taxonomy, and will be reviewed in those sections to follow.

Consensus

Braxton and Hargens (1996) and Del Favero (2003) have argued there is overlap in the concepts of consensus and paradigm development used to describe disciplinary differences. This view is supported by the work of Lodahl and Gordon (1972). Lodahl and Gordon (1972) supported the idea of paradigmatic development, but also validated the concept of scholarly consensus as a factor of disciplinary variation. As mentioned above, Lodahl and Gordon (1972) found that paradigmatic development is actually based on a level of consensus within a scientific field about theory, methodology, techniques, and problems.

Beginning from a different starting point, Hagstrom (1964, 1965) used Durkheim's (1984) concepts of mechanical and organic solidarity to study variation among disciplines. In particular he measured scientific teamwork on the basis of solidarity in research goals. Although Hagstrom (1964, 1965) only considered the scientific disciplines, he found that newer fields (e.g., nuclear physics) show different levels of consensus on research goals than older fields (e.g., chemistry). In this way Hagstrom (1964, 1965) gave some legitimacy to consensus as a disciplinary differentiating factor.

Hargens (1975) followed up on the work of Hagstrom (1964, 1965) and considered three disciplines (chemistry, political science, and mathematics) to determine if these fields showed variation in the functional aspects of their organization. The results demonstrated that the disciplines contrasted on two measures (functional and normative integration), which correspond to Dukheim's (1984) concepts of mechanical and organic solidarity (similar to the analysis of Hagstrom (1964). Since Hargens' (1975) categories of integration assume levels of consensus among scholars, his findings lend weight to consensus as a means of differentiation.

Hargens' (1975) study was followed by Hargens and Kelly-Wilson (1994) who used data from the 1984 Carnegie survey of over 3,000 faculty members at U.S. universities to analyze the

determinants of disciplinary discontent. Hargens and Kelly-Wilson (1994) used the concepts of consensus (equivalent to Hargens' (1975) normative integration) and anomie (as in Durkheim's (1984) concept of organic solidarity, and equivalent to Hargens' (1975) functional integration) to show disciplinary variation among scholars based on the perception that one's field is stagnant. Hargens and Kelly-Wilson (1994) found that variation in pessimism about the intellectual state of one's field can be explained by variation in anomie and consensus. In particular regarding consensus, it was shown that the physical sciences manifested low levels of pessimism while the social sciences have high levels. Since the physical sciences had higher levels of consensus than the social sciences, Hargens and Kelly-Wilson (1994) concluded that higher levels of disciplinary discontent could be accounted for by lower levels of consensus.

It should be noted that Hargens and Kelly-Wilson's (1994) study, as indicated earlier, revealed that the measures they utilized showed strong correlation to aspects of the Biglan (1973a, 1973b) classification groupings, as well as others (e.g. Becher, 1989). In particular, Hargens and Kelly-Wilson interpreted consensus (or normative integration) as being identical to the concept of paradigm development and to Biglan's (1973a, 1973b) hard/soft dimension (Braxton & Hargens, 1996, p. 12).

Braxton and Hargens (1996) argued that study of consensus is difficult because it implies that scholars not only agree on theories or methods, but that they are on some level consciously aware of their agreement. Braxton and Hargens (1996) stated that this is the reason (among others) no researcher has been able to yet measure all aspects of consensus directly. For these reasons, "attempts to assess levels of consensus in various fields…may find little or no variation either because there is no variation…or because the measures used in a particular study are unrelated or weakly related" (Braxton & Hargens, 1996, p. 17).

Some of the strongest arguments against consensus as a model of disciplinary variation have come from Cole (1983), who examined the postulate that sciences are arranged in a hierarchy, with well-developed sciences like physics at the top and social sciences like sociology at the bottom. Sciences at the top are presumed to display higher levels of consensus than those at the bottom. Cole looked at a set of empirical studies to evaluate the degree of cognitive consensus in disciplines. Though he found consensus at core levels, Cole's conclusion was that the disciplines do not differ in consensus at their research frontiers, the cutting edge of a field's research endeavors. He maintained this was true even though in each discipline consensus at the frontier is what he described as a loosely woven web characterized by substantial levels of disagreement. Cole's thorough and extensive study, therefore, calls into question whether consensus is a differentiating characteristic which only operates at the research core level, or one that extends globally to the frontiers of research.

Because of the various difficulties in establishing a model of consensus beyond the early work of Lodahl and Gordon (1972), and because of the overlapping of consensus and paradigmatic development models (Del Favero 2003), empirical research on consensus as an independent determinant of disciplinary variation has virtually disappeared since Cole's (1983) work. Other research (e.g., Becher, 1989; Hargens and Kelly-Wilson, 1994), continues to regard consensus as one determinant among others of disciplinary differences.

Codification

The major empirical studies on codification have already been reviewed (Zuckerman & Merton, 1971; 1972). Few other empirical studies have investigated codification as an explanation of disciplinary variation. Braxton and Hargens (1996) mentioned two studies, one by Price (1970), which found that more codified fields like chemistry and physics have greater proportions of references to recent works than fields like sociology or political science. Another

study by Gaston (1979) found that higher codification led to more allocation of scholarly rewards, but this study considered only the sciences of physics, chemistry, and biology.

Cole (1979) examined measures of scholars' eminence in five disciplines and found no evidence that disciplinary codification affects the how scholars rank on three measures: name recognition, perceived quality of work, and institutional prestige. Cole further studied six disciplines on three measures: age and number of citations, age of first important publication, and years between obtaining a doctorate and one's first important publication. In all cases there was little evidence that there was a difference between highly codified fields and less codified ones. Cole therefore refuted one of the conclusions of Zuckerman and Merton (1972) by showing that scholars in highly codified disciplines do not make important contributions at an earlier age than scholars in less codified disciplines (Braxton & Hargens, 1996).

Cole's (1979) was the last serious empirical work done on codification as an explanation for disciplinary variance, and it is a resounding refutation of the codification system. Braxton and Hargens (1996) also pointed out that no researchers have attempted to develop measures of codification that would allow one to array disciplines along this dimension. Finally, further consideration of codification in the research literature has been subsumed into studies on consensus, which Del Favero (2003) has indicated is a basis for codification.

Organizational Structure Approaches

Of all the approaches to explaining disciplinary differences, those based on sociological or organizational structure have received the least attention. The studies of Collins (1975), Whitely (1984), and Fuchs (1992) have already been elaborated upon. The organizational structure approach, however, has not inspired much in the way of empirical research. Braxton and Hargens (1996) suggested this is so because of the

> Difficulties one encounters in operationalizing basic concepts…and even greater hurdles that need to be overcome to assess basic causal assertions…In addition, it is not clear that

> the additional dimensions and subdimensions suggested… are needed to account for disciplinary differences…Thus although it may prove valuable as a source of insight and hypothesis, it seems doubtful that the organizational structure approach will generate the sustained attention and development currently enjoyed by the "paradigm development" and Biglan model frameworks. (p. 7)

Indeed, since Whitely (1984) and Fuchs (1992), the literature is void of empirical studies along these particular conceptual lines.

The Becher Taxonomy

As already mentioned, Becher's research and conceptual analysis (Becher 1981,1984,1987,1989, 1994; Becher & Trowler, 2001) primarily aimed at generating theoretical categories rather than formally testing his conceptual classification system (Braxton & Hargens, 1996). Three of these studies (Becher, 1981, 1989; Becher & Trowler, 2001) involve the actual collection and analysis of empirical data. In this sense, each of these studies is further empirical validation of the taxonomy Becher suggested (see Table 2.1). The other three studies (Becher, 1984, 1987, 1994) utilize the empirical data collected in the first three studies and expand the conceptual analysis of this data. In the first, Becher (1984) utilized his research as a basis for a cultural view of higher education with emphasis on the impact of disciplinary cultures. In the second, Becher (1987) drew implications from his taxonomy relative to the nature of the academic profession, showing how disciplinary variation variegates the profession. Finally, Becher (1994) made a commentary on the overall significance of this taxonomy: he argued that the disciplinary cultural aspect of higher education organization has implications on three levels of higher education research. The first is the macro level (comparison of higher education systems), second is the meso level (studies of institutional management), and finally the micro level (activities within individual departments). Becher did not explore these implications in empirical studies, but others have used his taxonomy in whole or in part to do so.

Here it should be noted that Silver (2003) challenged the concept that a university has a culture at an institutional level (Becher's (1994) macro level). Silver argued that such a broad definition of culture in higher education could not be upheld. According to Silver, the organizational enterprise in higher education is too complex and anarchical to be pinned down to a definable institutional culture. He did allow that the concepts of culture apply to the organization and functioning of the individual academic departments (Becher's micro level) as defined by their discipline. Nevertheless, Silver maintained that the disciplinary parts of the collection could be defined as subcultures in proximity to one another did not allow them to be aggregated into a single institutional culture.

Kekale's Use of Becher's Taxonomy to Study Academic Leadership at the Departmental (Micro) Level

A search of the literature revealed that Kekale (1999, 2001) is the only researcher to have used Becher's (1989) complete taxonomy as the conceptual framework for his empirical study. Kekale (1998) began with a larger model of academic leadership based on various theoretical underpinnings (primarily Becher, 1994). Kekale (1999, 2001) then conducted a qualitative empirical study to verify different patterns of leadership on the departmental or micro level (Becher, 1994). In this method, Kekale (1999, 2001) used Becher's (1989) taxonomy to characterize the distinctiveness of different academic departments.

Kekale (1998) made an attempt to form a heuristic model of leadership in the academic setting. Kekale looked at those leadership theories which most impact the cultural perspective of leadership; namely, certain elements of contingency theories, power and influence theories, and cognitive approaches. His basic contention was that academic leadership is above all situational. Kekale argued that leadership is not a single-direction process, but a dynamic interaction between leaders and their contexts. Different circumstances, he maintained, call for different leadership. Kekale argued that educational organizations in the broad scope (macro), as well as

academic departments on the smaller scale (micro) differ from each other in terms of history, national context, tasks, and disciplinary basis. In this case Kekale's model was based only partly on the cultural view promoted by Becher (1984, 1989) with respect to the disciplinary basis of differences in academic leadership.

Having established a broad conceptual model (Kekale, 1998) for academic leadership, Kekale (1999) undertook an empirical study (expanded in Kekale, 2001) focused on the disciplinary part of his model. The purpose of Kekale's studies was to determine preferred patterns of leadership in the different disciplinary cultures of academic departments. Kekale used Becher's (1989) taxonomy as the frame for distinguishing aspects contributing to different leadership styles in four departments: physics, history, sociology and biology. All four of these disciplines had been the subject of Becher's (1989) study and were defined in his taxonomy as being a fourfold combination of characteristics: hard or soft, pure or applied, convergent or divergent, and urban or rural (see Table 2.1). Kekale interviewed 56 academics in eight departments representing the four disciplines. This data was qualitatively analyzed by coding selective themes. Kekale found at least four types of leadership culture among them. The four differences in leadership cultures correlated with differences in the combinations of categories in the Becher (1989) taxonomy relative to each discipline.

Kekale (1999, 2001) showed that in the soft, pure, divergent, and rural discipline of sociology, a democratic and collegial academic leadership style is preferred. In the soft, pure, convergent, and rural discipline of history, the style was seen as more individualistic. Within the discipline of biology, which was reflective of the soft, pure, divergent, and rural categories, there was a lot of informal information sharing and decision making in this department, and they disliked strong leaders and managerialism in leaders. In the pure, hard, convergent, and urban discipline of physics, managerial and teamwork characteristics were more favored leadership

qualities. Kekale's findings, therefore, validated Becher's (1989) taxonomy as a useful framework for assessing disciplinary variations in the context of academic leadership.

Other Empirical Studies Utilizing the Concepts of Becher's Taxonomy

While not a true empirical study, but a metanalysis, Neumann (2001) gathered various empirical research findings on teaching and learning and classified them according to discipline. Neumann examined teaching preferences, approaches, and outcomes as well as student learning. The studies gathered present a picture of a varied landscape of teaching and learning, which is partially explained by disciplinary variation based on Becher's (1989) demonstration of the connection between disciplinary culture and disciplinary knowledge. Neumann suggested that disciplinary variations in teaching and learning have implications at the macro, meso, and micro levels (Becher, 1994). According to Neumann, on the micro level, there are implications for personnel policies and student evaluation. On the meso level, institutional staff development and institutional learning are impacted. And at the macro level, national policies with regard to funding are also affected. Neumann's conclusions argue for Becher's (1994) assertion of the implications of disciplinary variation on macro, meso, and micro levels, as well as against Silver's (2003) assertions about the lack of university culture on the macro level.

In a phenomenological study of research activities, Brew (2001) agreed that disciplinary differences do, as Becher (1989) suggested, have an impact on how researchers conceptualize their work. However, Brew argued that different research activities are also the result of other characteristics of the individual researcher. Brew maintained that Becher's (1989) analysis failed to provide a comprehensive map of the variation in how research is experienced. Becher's (1989) analysis, Brew suggested, showed that individuals' conceptions of research are a function of a complex set of factors, of which disciplinary allegiance is one. Although she was examining

the phenomenon of variations in research in what she envisioned as a broader perspective, Brew at least partially validates Becher's (1989) conceptual framework of disciplinary differences.

Tight (2003) compared the organization of academic knowledge across disciplines. The basic purpose of Tight's study was to examine and try to explain why the organization and naming of academic departments varies from country to country, using data from Australia, Nigeria, and the United Kingdom. Using Becher's taxonomy (Becher, 1989; Becher & Trowler, 2001) as part of his interpretive framework, Tight found evidence that forms of institutional organization and naming varied according to the varying strength of the different disciplines or fields of study in the different geographical regions. In the process, Tight pointed out an overlooked aspect of Becher's (1989) conceptualization of disciplinary differences: they are not totally stable. Tight's analysis confirmed Becher's (1989) admission that disciplinary cultures are subject to both historical and geographical variation. The changing nature of knowledge domains over time has an impact on the identities and cultural characteristics of disciplines, in particular across geographical boundaries.

Studies Using the Biglan Model

Empirical validations of the Biglan (1973a, 1973b) model fall into three main groups: those which seek to establish the applicability of the model across various types of higher education institutional settings, those which seek to establish the validity of the model over a broader variety of disciplines, and those which use the model as a framework for investigating more specific issues of disciplinary variation. All of these studies employ the Biglan model sometimes in whole, other times only in part, and in most cases have found the model to be robust (Braxton & Hargens, 1996).

Studies Testing the Biglan Model Across Diverse Institutional Settings

Smart and Elton (1975) were the first to test Biglan's (1973a, 1973b) model looking at goal orientations of academic departments. In a very broad study, Smart and Elton (1975) examined variations in goal orientations of 488 academic departments in thirty-two public universities nationwide. Department chairs were polled on eleven different goals. Discriminant analysis showed differentiation on three functions which were highly consistent with the three dimensions of Biglan's (1973a, 1973b) model: concern with paradigm (hard/soft), concern with application (pure/applied), and concern with life systems (nonlife/life). Those departments classified as hard put more emphasis on research, graduate education, and faculty development than soft departments. Applied departments were more concerned with development of students, graduate programs, and services than pure departments. And life departments focused on service and administrative efficiency more than nonlife departments.

In a later study, Smart and Elton (1982) wanted to find out if the bases of the Biglan model were valid when applied to a more comprehensive set of research measures and a more heterogeneous faculty sample than in prior studies. Their new study (Smart & Elton, 1982) sample was of 14,311 respondents in 301 institutions of higher education. From 71 variables, factor analysis was done to pare down the factors to five: professional success, focus on administration, research opportunities, faculty conservatism, and character development. Discriminant function analysis was used to test the empirical validity of the three dimensions of the Biglan (1973a, 1973b) model through determination of the number of statistically significant functions.

The results of the Smart and Elton (1982) study provided strong support for the empirical validity of the Biglan (1973a, 1973b) model. For example, the findings revealed that hard disciplines were more concerned with research than soft; applied disciplines spent more time in

administration than pure ones; and life disciplines had more concern with professional success than nonlife disciplines. In terms of statistical significance, the Biglan (1973a, 1973b) groupings accounted for 64 percent of the variance in pure versus applied, 34 per cent in hard versus soft, and 4 percent in life versus non-life.

Creswell and Roskens (1981) argued that they found a flaw in the Biglan model: it does not apply as well to institutions that are not research or doctorate granting schools. In a study which sought to determine the applicability of Biglan's (1973a, 1973b) model to institutions other than doctorate-granting schools, Creswell and Roskens (1981) studied 9,000 faculty in 158 institutions and five different institutional types representing the major Carnegie classifications. A survey was used which consisted of 128 questions coded into 781 variables, with primary fields of research, scholarship, and creativity as the dependent variables. While Creswell and Roskens (1981) found that the model could be generalized to both comprehensive colleges and research institutions, it could be done only in a limited way. Namely, only the hard/soft dimension seemed to be universal across institutional types. Pure/applied, and life/nonlife distinctions were less clear. While the sample was very large and broad, the researchers did note that their study was limited by the fact that there may be variables other than the ones selected which discriminate between Biglan groups.

Studies Seeking to Expand the Number of Disciplines Included in the Biglan Groups

Two studies had as their goal to broaden the thirty-four disciplines covered by the eight classifications of the original Biglan (1973a, 1973b) model. In the first, Malaney (1986a) examined 114 academics units in a large public research university and attempted to categorize them by Biglan's (1973a, 1973b) dimensions. Based on interviews with administrators of the graduate school, Malaney (1986a) operationally defined the three Biglan (1973a, 1973b) dimensions and then coded all 114 academic units on 4-point scales for each of the dimensions.

As a reliability check on his coding, Malaney (1986a) showed that his system categorized thirty-three of the thirty-four disciplines in the same groupings as Biglan (1973a, 1973b) did.

Stoecker (1993) points out two weaknesses of Malaney's (1986a) results. First, the 114 academic degree programs may or may not adequately define 114 disciplines. Second, and more importantly, Malaney (1986a) used data from only one institution. Stoecker (1993), seeking to expand the Biglan (1973a, 1973b) categories in a more systematic and comprehensive way, undertook a study using a national database and a more restricted statistical classification of disciplines.

Stoecker's (1993) purpose was not only to continue classification of disciplines not formerly classified by Biglan (1973a, 1973b), but also to replicate previous work on the validity of the classification system. Noting that more current Carnegie data allow continued investigation beyond disciplines already validated in the Biglan (1973a, 1973b) scheme, Stoecker (1993) replicated previous work on validation and extended it to disciplines not formerly classified by Biglan. Stoecker focused on faculty time use (also studied by Muffo & Langston 1981), scholarly output, research funding sources (also studied by Creswell and Bean, 1981), and faculty attitude (also studied Smart & Elton, 1982). Stoecker (1993) used discriminant analysis on several operationally defined factors in each of these four categories to validate the classification of most of the original 34 disciplines studied by Biglan (1973a, 1973b), and to extend the Biglan dimensions to eight more disciplines. Two disciplines had at least 50% of the predicted group membership in one Biglan cluster: Dentistry and Nursing. Six others were less clearly in a single group, but had 25% or more of predicted group membership in a cluster: Art, Business, Law, Medicine, Music, and Social Work.

Even though she was only able to convincingly add two disciplines (Dentistry and Nursing), Stoecker's (1993) validation of the already established disciplines supported the

continued use of the Biglan (1973a, 1973b) classification system as a valid conceptual framework for studying the academic disciplines in higher education. Stoecker (1993) also suggested that difficulty in classifying new fields might be the result of diverse, interdisciplinary subject matter, and the stage of academic development of the discipline.

Studies Using the Biglan Model to Test Variations of Particular Aspects of Disciplinarity

Smart and McLaughlin (1978) conducted a study about the reward structures of academic disciplines in which they found support for only the hard/soft and pure/applied dimensions of the Biglan (1973a, 1973b) classifications. The sample used was 1,320 faculty at a large research university who responded to a questionnaire about professional responsibilities. These measures were used to predict faculty salaries in the eight Biglan (1973a, 1973b) groupings. The results showed wide variation in reward structures between the groups, but only along the lines of the hard/soft and pure/applied distinctions. These results correspond with the findings of Creswell and Roskens (1981) and Smart and Elton (1982), both of which found the strongest support for the hard/soft and pure/applied classifications.

Muffo and Langston (1981) studied how faculty salaries and staffing patterns differed across departments grouped in the Biglan (1973a, 1973b) categories. Data used were from salary data at the University of Illinois, as well as a faculty salary survey conducted by Oklahoma State University covering faculty at seventy-one universities. Analysis of variance was used to determine significant differences between staffing and salary patterns across the groups.

The result with the University of Illinois salary data was that all three dimensions had significantly different salaries. Average salaries in hard departments were lower than those in soft areas; average salaries in nonlife disciplines were higher than those in life ones; and salaries in pure and applied groups also showed significant differences in some faculty ranks. These results were replicated in terms of the relative differences in the Oklahoma State survey data, but

were not statistically significant in all cases. In terms of staffing patterns, Muffo and Langston (1981) found some, but not all differences across the groups to be significant. Pure and nonlife disciplines had the greatest number of students; hard and nonlife disciplines had the greatest number of faculty; and, soft, pure, and nonlife disciplines had the highest instructional ratios.

Muffo and Langston (1981) suggested that the inconsistency in their results could have resulted from incorrect categorizing of departments into the eight disciplinary groups, based on different institutional classifications (e.g., Research I and II institutions as opposed to Doctoral I and II in the old Carnegie system). They concluded from their results that the Biglan (1973a, 1973b) model is useful in making comparisons both within and among institutions on disciplinary lines, but care must be taken in making these comparisons to correctly map departments from different classes of institutions into the eight disciplinary classifications of the model.

Creswell and Bean (1981) used a national survey of faculty as the basis for validating the Biglan (1973a, 1973b) model on the basis of research output and sources of faculty funding. Using discriminant analysis, Creswell and Bean (1981) found significant distinctions in these areas consistent with the Biglan (1973a, 1973b) distinctions. Scholarly output in the hard disciplines was more often in journal articles, whereas in the soft disciplines it was more often in the form of books. Research funding for pure disciplines was more federal money, as opposed to applied faculty who received more private research funding. Similarly, life disciplines got more state funding, while nonlife ones got more federal dollars. Creswell and Bean (1981) therefore concluded that all three Biglan (1973a, 1973b) dimensions are valid in distinguishing faculty groups based on research output measures and sources of research funding.

Following up on his earlier study categorizing university departments in the Biglan (1973a, 1973b) scheme, Malaney (1986b) studied the characteristics of graduate students in

relation to their chosen fields as defined by the three dimensions of the Biglan system. Surveying newly enrolled graduate students at a public research university, Malaney (1986b) seven independent variables: gender, citizenship, age, undergraduate grade-point average, level of degree pursued, and GRE scores. These were analyzed on three dependent variables corresponding to the three Biglan (1973a, 1973b) dimensions. Utilizing linear regression models and discriminant analysis, Malaney (1986b) was able to explain variance in each dimension ranging from 10 percent in the pure/applied distinction, to 37 percent in the hard/soft dimension. Some examples of his findings include more importance for GRE scores in the hard disciplines over the soft, and more masters degrees are pursued in applied disciplines and more doctorates in pure. Malaney (1986b) did not find specific significant differences in the life/nonlife dimension. Once again his results were consistent with the degree of explanation provided by the individual dimensions (hard/soft the strongest, life/nonlife the weakest) with various other studies (Creswell & Roskens, 1981; Smart & Elton, 1982; Smart & McLaughlin, 1978).

Cashin and Downey (1995) found that the Biglan (1973a, 1973b) groupings of disciplines did not explain disciplinary differences in college students' ratings of instruction. Cashin and Downey used data from the IDEA (Instructional Development and Effectiveness Assessment) system, which is a system of student ratings of instruction and effectiveness, and which also includes and faculty component. This system provided a database of over 100,000 classes which were then placed in the Biglan (1973a, 1973b) categories. Examining differences is responses to the assessment across disciplines, Cashin and Downey (1995) found significant differences between individual disciplines on the basis of perceptions of what is taught, how it is taught, and how it is learned. However, when disciplines were grouped into the Biglan (1973a, 1973b) groups, the differences could not be systematically related to the Biglan clusters.

In a study examining only one of Biglan's (1973a, 1973b) dimensions, Hargens (1996) studied citation patterns in publications as a means of assessing the validity of the hard/soft dimension. Looking at nine research areas spanning Biglan's hard/soft dimensions, Hargens considered the argument that in research areas with high levels of consensus (hard disciplines), scholars heavily cited recently published documents; but in low consensus areas (soft disciplines) there was no disproportionate citation of recent articles. Hargens looked at published reviews and indices and created publication lists of cited works in nine disciplines. Out of the nine disciplines examined, four physical science specializations (hard) studied showed over citation of recent publications, while four social science (soft) disciplines did not. From these results, Hargens concluded the Biglan (1973a, 1973b) model reflects differences in level of consensus across the disciplines along the hard/soft division.

Paulsen and Wells (1998) noted that the literature on epistemological beliefs shows evidence that students' epistemological beliefs affect their motivation, cognition, and academic performance, and that most studies viewed these differences as domain independent. To explore these issues, Paulsen and Wells conducted a study to see if these variations were affected by disciplinary differences. They surveyed 290 students at a large urban public university who were enrolled in fourteen classes in six disciplines (Philosophy, English, History, Psychology, Biology, and Geology). These major fields were classified in domains according to the hard/soft and pure/applied dimensions established by Biglan (1973a, 1973b). Students' epistemological beliefs were assessed by administering the Schommer Epistemological Questionnaire, which is based on a multidimensional construct that views epistemological beliefs as a system of four largely independent beliefs. These dimensions are simple knowledge and certain knowledge, naïve beliefs about the nature of knowledge, fixed ability and quick learning, and naïve beliefs about the acquisition of knowledge. The questionnaire contained 63 short statements

corresponding to each of the four dimensions, and students were asked to rate each statement on a five point Likert scale. A series of analyses of variance revealed significant differences across the hard/soft and pure/applied dimensions. Results indicated that students in pure fields were less likely than those in applied to hold naïve beliefs in simple knowledge, quick learning, and certain knowledge; and those majoring in soft or pure fields were less likely than others to hold naïve beliefs in certain knowledge.

Schommer-Aikins, Duell, and Barker (2003) also did a study utilizing Schommer's Epistemological Questionnaire, as well as two other questionnaires, assessing disciplinary differences across domains classified in the Biglan (1973a, 1973b) system. They surveyed 152 college students about their epistemological beliefs relative to mathematics (hard/pure), the social sciences (pure) and business (neither hard nor pure). Questionnaires dealt with students' beliefs about the stability and structure of knowledge, and the control and speed of learning. Analyzing the results with regression and correlation analyses, Schommer-Aikins, et al. (2003) found that epistemological beliefs of college students were moderately domain general. That is, there were moderate correlations between epistemological differences based on the Biglan (1973a, 1973b) groupings.

Barnes, Agago, and Coombs (1998) investigated the relationship between job-related stress and faculty intent to leave academia. They hypothesized that one variable influencing faculty decisions was their discipline. Defining five stress variables, Barnes, et al. studied the effects of academic discipline, tenure status, and gender on these variables. Based on data from a national faculty survey of 3,070 full-time tenure-track faculty, Barnes et al. found two significant correlates among the five variables they defined in terms of explaining intent to leave academia, namely time commitment, and sense of community. Relevant to this review, they found that academic discipline, categorized according to the Biglan (1973a, 1973b) scheme

accounted for only 2 percent of the variance explained. While this study did not have as its intent a validation of the Biglan (1973a, 1973b) model, the small amount of variation it explained showed that it was only a minor contributor in the model Barnes et al. developed to explain this particular higher education phenomenon.

In a similar vein, Li, Long, and Simpson (1999) conducted a study to examine the influence of disciplinary differences on self-perceived gains in critical thinking and communications skills among university students in terms of student background characteristics, major course selections, and other college experience variables. Disciplines were divided into two groups representing the hard/soft dimension of the Biglan (1973a, 1973b) system. The model that Li, et al. developed was able to explain up to 25.3 percent of the variance in self-perceived gains in critical thinking and communication skills among the students tested, but they found that there were no significant differences on the basis of hard or soft disciplinary groupings.

In another variation on this theme of inquiry, Pike and Killian (2001) examined the differences in students' college experiences, self-reported gains in learning, and learning outcomes, this time using Biglan's (1973a, 1973b) pure/applied dimension as a contrast. Based on a questionnaire administered to 2,000 students at a Midwestern university, Pike and Killian expected that students in applied disciplines would be more positive about the college environment, be more involved, and have greater gains in intellectual development than those in pure disciplines. The results of the study were mixed. Significant differences between pure and applied disciplines were found with regard to college experiences and learning outcomes; however, reported learning differences were found to be related to disciplinary content and not Biglan's (1973a, 1973b) pure/applied distinctions.

Sinclair and Muffo (2002) used Biglan's (1973a, 1973b) model as the conceptual framework for an analysis meant to assess how writing-intensive courses impact students' perceptions of writing. Their sample consisted of 2,570 students in forty departments enrolled in writing-intensive courses. Sinclair and Muffo found that students in hard (as opposed to soft) disciplines as well as those in pure (as opposed to applied) disciplines were more likely to agree that revision of writing improves understanding of the subject matter and having access to the writing of other students also improves understanding. Students in life disciplines were more likely to agree that revising improves understanding and that course assignments improve writing than students in nonlife disciplines. Statistically, however, significant differences were only found in the pure/applied and life/nonlife distinctions. Sinclair and Muffo (2002) concluded that the Biglan (1973a, 1973b) model can provides some insight into the types of teaching methods most appropriate in particular disciplines, but interestingly found this to be most true in the two dimensions (pure/applied and life/nonlife) which have the least support in other studies (which most often show the hard/soft distinction as the strongest, e.g., Malaney, 1986b; Smart & Elton, 1982).

In contrast, a study by Whitmire (2002) validated all three dimensions of the Biglan (1973a, 1973b) model. Whitmire used the responses of 5,175 undergraduate students at thirty-eight institutions responding to questions on the College Student Experiences Questionnaire (CSEQ) to evaluate disciplinary differences in information-seeking behavior (e.g., using the library, using the online catalog, using indexes, checking citations, and checking out books). The variables were background characteristics, academic discipline, and information-seeking behavior. Utilizing independent t-tests, Whitmere found significant differences in information-seeking behavior between students hard versus soft, pure versus applied, and life versus nonlife

disciplines. Whitmere concluded that the entire Biglan (1973a, 1973b) model provides a valid framework for understanding undergraduates' information-seeking behavior.

Finally, a study by Del Favero (2006) indicates the currency of elements of the Biglan (1973a, 1973b) model for educational research. In an examination of the relationship between academic discipline and cognitive complexity in academic deans' administrative behavior, Del Favero found that pure/applied dimension (Biglan, 1973a, 1973b) was a significant predictor in the relationship between cognitive complexity and administrative behavior of academic deans.

Research Methodology and Research Paradigms in the Social and Behavioral Sciences

The research intends to compare disciplines on the basis of preferred research methodologies: quantitative, qualitative, or mixed methods. Further, this comparison is to take place across the pure and applied dimensions in the soft/life category of the Biglan (1973a, 1973b) system of classification. Soft/life disciplines in Biglan's (1973a, 1973b) scheme fall into a group more generally known as the behavioral and social sciences (e.g., Psychology, Anthropology, Education, Sociology, etc.). It is important, therefore, to undertake a brief review of the development of research methodologies common to this group of disciplines and the issues surrounding the philosophical paradigms underlying these methodologies.

Note that many of the topics reviewed here are further elaborated in specific detail in Chapter 3 where they provide rationale for the operational definitions developed to be used in the code sheet that serves as the data collection instrument in the study.

The Evolution of Three Research Methodologies: Paradigms and Wars

A paradigm is a worldview or belief system that underlies and guides researchers as they make inquiry (Denzin & Lincoln, 2005a; Gauch, 2003; Tashakkori & Teddlie, 1998). Paradigms carry a number of assumptions and presuppositions associated with their specific world view, including notions of epistemology, ontology, axiology, logic, etc. (Gauch, 2003, Tashakkori &

Teddlie, 2003). Paradigms and their assumptions are what guide the research methodologies commonly known as quantitative, qualitative and mixed methods (Creswell, 2002, 2003; Johnson & Christensen, 2004; Teddlie & Tashakkori, in press). The evolution of these methodologies in the social and behavioral sciences, however, has been less than pacific (Tashakkori & Teddlie, 1998) and a brief review of this history is helpful.

Although there were exceptions seen in ethnographic work in anthropology and community studies and symbolic interactionism in sociology (Teddlie & Tashakkori, in press) the dominant and most well-known methodological orientation for most disciplines in the social and behavioral sciences for the first half of the 20th century followed a positivist paradigm (Johnson & Christensen, 2004; Teddlie & Tashakkori, 2003). This orientation began to be transformed in the 1950 to1970 period with the postpositivist movement, though methods remained entirely quantitative. In the period 1970 to1985, qualitatively-oriented researchers began to be critical of the positivist paradigm and began to propose a wide variety of qualitative research methods based on the paradigm of constructivism (Teddlie & Tashakkori, 2003).

Teddlie and Tashakkori (2003) noted that once qualitative methods began to gain widespread acceptance, debate ensued about superiority of methodologies, and the inevitable question arose about the possibility of mixing quantitative and qualitative methods in a single study. The result was the so-called paradigm wars (Gage, 1989). Arguments ensued about the suitability of qualitative methodologies in the social and behavioral sciences, and the suggestion that methods could not be mixed due to the incompatibility of the paradigms founding each methodological approach (positivist versus constructivist) (Johnson & Christensen, 2004; Tashakkori & Teddlie, 1998; Teddlie & Tashakkori, 2003).

In the last decade, the promotion of pragmatism as a paradigm for mixed methodology has developed (Johnson & Christensen, 2004; Teddlie & Tashakkori, 2003). Pragmatism

proposes that whatever research methods are necessary to answer an inquiry can be used together because quantitative and qualitative methods are compatible (Teddlie & Tashakkori, 2003). The advancement of this compatibility thesis has helped to usher in a new era of mixed methods as a third and separate field of research methodology in the social and behavioral sciences. In their volume on mixed methods research in the behavioral and social sciences, Tashakkori and Teddlie (2003) included chapters that highlight the three research methods as utilized in various disciplines including Management, Health Sciences, Nursing, Psychology, and Sociology.

Contributions to the Understanding of Paradigms and Research Methodologies in the Social and Behavioral Sciences

This section of the literature review explicates the brief outline of the previous section by highlighting significant contributions to the understanding of the various paradigms and three research methodologies currently used in the behavioral and social sciences. Several areas of development are covered: the advent of qualitative research and the proliferation of research paradigms, the debate about the superiority and/or compatibility of paradigms, the conception of pragmatism and the use of mixed methods, the link between paradigms and methods, and the notion of a research continuum.

The Advent of Qualitative Research and the Proliferation of Research Paradigms

As mentioned above, until the middle of the 20th century there was basically only one way of doing research, whether in the pure sciences or the social and behavioral sciences: quantitative methodology informed by the "scientific" method or positivist paradigm (Johnson & Christensen, 2004; Gauch, 2003; Teddlie & Tashakkori, 2003). From the 1950s forward, researchers in the social and behavioral sciences began to criticize the positivist paradigm and recognize that other methods (qualitative) were viable, and were in fact being utilized, albeit often unrecognized (Teddlie & Tashakkori, 2003).

The watershed in the development and understanding of qualitative methods came in the work of Lincoln and Guba (1985). In their book *Naturalistic Inquiry*, Lincoln and Guba (1985) laid out what they called the naturalistic paradigm. The naturalistic paradigm was set in contrast to the received or positivist paradigm (Teddlie & Tashakkori, 2003). In systematic fashion, Lincoln and Guba (1985) defined the naturalistic paradigm, contrasted it to the positivist paradigm, and showed its viability. Lincoln and Guba (1985) dealt with the key paradigmatic issues: ontology, making an argument for a relativist point of view; epistemology, showing how a subjectivism can be credible; axiology, demonstrating how sound inquiry can be value-bound; and the possibility of generalization, showing the transferability of qualitative conclusions. Beyond this, Lincoln and Guba (1985) laid out a framework for designing, implementing, and showing the trustworthiness of naturalistic inquiry. In this fashion, Lincoln and Guba (1985) contributed greatly to the advancement and legitimacy of the paradigm they called naturalistic, and would later be subsumed in the paradigmatic view called constructivism, and which supports qualitative methodology (Teddlie & Tashakkori, 2003).

Denzin and Lincoln (1994, 2000, 2005a) have made a major contribution to furthering qualitative research in the publication of three editions of the *Handbook of Qualitative Research*. This compendium of articles has consistently brought together the cutting edge of research and development in the area of qualitative methodology. In each edition, Denzin and Lincoln have organized studies on the history and applied traditions of qualitative research, the paradigms structuring and influencing qualitative research, strategies of inquiry used in qualitative research, research design, and methods of collecting and analyzing empirical data. Over twenty years ago, Lincoln and Guba (1985) gave researchers impetus to do qualitative research, and over the intervening years Denzin and Lincoln have given them handbooks of the latest rationale and methods of qualitative inquiry.

Creswell (2002) provides a succinct overview of significant contributions over the past three decades which advanced the rise of qualitative methods in the social and behavioral sciences. These include: introducing all aspects of designing a qualitative study (Bogdan & Biklen, 1982); presenting detailed procedures for qualitative data analysis (Miles & Huberman, 1984); introducing the design of qualitative research (Marshall & Rossman, 1989); advancing ideas about ethnographic research (Wolcott, 1994); advancing procedures for conducting grounded theory qualitative research (Strauss & Corbin, 1990); and distinguishing among five different procedures of qualitative inquiry (biography, phenomenology, grounded theory, ethnography, and case study)(Creswell, 1998).

As the number of qualitative methodologies increased, so did the number of paradigms underlying and founding these methods. In the most recent version of the *Handbook* (2005a), Denzin and Lincoln (2005b) noted that over the years qualitative inquiry has come to be supported by numerous paradigms, of which they name the major four as: positivist/postpositivist, constructivist-interpretivist, critical (Marxist, emancipatory) and feminist-constructural. In another article in the same volume (Denzin & Lincoln, 2005a), Guba and Lincoln (2005) noted the paradigms as positivism, postpositivism, critical theory (encompassing emancipatory and transformative), and constructivism. Creswell (2003) named four: postpositivism, constructivism, advocacy/participatory, and pragmatism. The issue of how to designate the predominate paradigms of qualitative research is taken up again in Chapter 3, where operational definitions are outlined in order to efficiently code research articles.

Research Paradigms: Better or Worse, Compatible or Incompatible?

Kuhn (1962, 1970) argued that competing paradigms can co-exist within a science. However, since qualitative paradigms developed through criticism of the previously dominant positivist paradigm (Lincoln & Guba, 1985), and since qualitative methodologies emphasized

their uniqueness from quantitative ones (Denzin & Lincoln, 1994), it was inevitable that conflicts would arise over which paradigm was superior or should be used in a particular discipline, or whether the paradigms could be combined in a single research study. These were philosophical battles were labeled the "paradigm wars" (Gage, 1989, p. 5).

Concerning the appropriateness of superiority of a methodology, Cook and Campbell (1979) are representative of the point of view that the positivist/postpositivist quantitative methodology should be used. Lincoln and Guba (1985) would be representative of the naturalist/constructivist point of view promoting qualitative methodologies as often superior. Tashakkori and Teddlie (1998) proposed that the debate focused on the relative importance of internal validity (emphasizing the positivist preference for controlled settings) and external validity (emphasizing the favored naturalistic settings of the constructivists).

As part of this debate, some argued that the two paradigms were so mutually exclusive that dialogue between them was not even possible (Smith & Heshusius, 1986). This point of view was known as the "incompatibility thesis" (Tashakkori & Teddlie, 1998, p. 4). In direct contradiction to this point of view is perhaps the greatest single contribution to this debate, a volume by Guba (1990), appropriately titled *The Paradigm Dialog*. In this book, Guba (1990) gathered points of view from the postpositivist, constructivist, and alternative paradigm camps. An appeal was made for the need for dialogue, and various authors discussed aspects of knowledge accumulation, values, and methodologies resulting from various paradigms.

Arguing against the incompatibility thesis, Datta (1994) gave five reasons for coexistence of the methodologies and their underlying paradigms. Datta (1994) argued that both paradigms have been used for years independently, many individual researchers have used both successfully, funding has been found for both, both have influenced policy, and much has been learned from each paradigm.

Howe (1988) went a step further, and argued in favor of what he called the "compatibility thesis" (p. 11). Howe employed a pragmatic philosophical perspective to argue that there is no incompatibility at either the level of practice or that of epistemology between quantitative and qualitative methods of research. Howe pursued his argument along two interrelated lines. First, Howe illustrated how, in practice, differences between quantitative and qualitative data, design, analysis and interpretation can largely be accounted for in terms of differences in research interests and how best to pursue them. Howe suggested that these differences may not even need to posit different epistemological paradigms. Secondly, Howe followed with an argument that the positivist and constructivist paradigms can be used not only to construct quantitative and qualitative methods respectively, but vice versa as well. This two-way relationship between paradigms and methods contradicts any claims to incompatibility. Finally, Howe suggested that researchers should do whatever works, and this represents a paradigmatic perspective called pragmatism.

It should be noted that the pragmatist paradigm described by Howe (1988) is much more specific to the research effort than the broad philosophical systems developed by Charles Sanders Pierce or William James which are also called pragmatism (Maxcy, 2003). Rather, Howe's (1988) thinking is more in line with the pragmatism supported by John Dewey as a method of inquiry (Maxcy, 2003). Howe's (1988) approach is what Maxcy (2003, p. 86) calls the "meta-methodological position" relative to the place of pragmatism in general inquiry, which holds that pragmatists can provide ways to understand the problems and issues within research methodology.

Reichardt and Rallis (1994) supported Howe's (1988) view of pragmatism and focused on possible partnerships between quantitative and qualitative methods. Reichardt and Rallis argued that several fundamental values are shared between the methodologies. Most significant

among these is what Reichardt and Rallis called the principle of undetermination of theory by fact. This theory maintains that "any given set of data can be explained by many theories" (Reichardt & Rallis, 1994, p. 88). Therefore, any data can be potentially explained by either quantitative or qualitative methodologies. Tashakkori and Teddlie (1998) suggested Reichardt and Rallis' conclusions imply that there is a common set of beliefs in the social and behavioral sciences that support a paradigm distinct from positivism or constructivism, and which has been labeled pragmatism (Howe, 1988).

The Pragmatist Paradigm and Mixed Methodological Research

The paradigm wars have largely subsided in recent years (Denzin & Lincoln, 1994; Tashakkori & Teddlie, 2003; Teddlie & Tashakkori, 1998, 2003). Nearly 20 years of qualitative studies yielding meaningful results make a strong argument that qualitative methodologies have a place beside quantitative methodologies in the social and behavioral sciences (Datta, 1994).

Onwuegbuzie and Leech (2003) argued that the paradigm wars have been detrimental to social and behavioral research and that a pragmatic approach is essential to advance research in these fields. Onwuegbuzie and Leech (2005) further suggested that the "Q" be taken out of discussions of research methodology (i.e., research methodology in the behavioral and social science should be simply "research methodology" and not quantitative research and/or qualitative research). Onwuegbuzie and Leech (2005) maintained that the best way to do this is simultaneously utilizing quantitative and quantitative methodologies in a mixed methodological framework.

Bryman (2006) suggested that the relative paradigm peace that has ensued in recent years has created favorable conditions for research combining quantitative and qualitative elements. Based on interviews with researchers in the social sciences who employ mixed-methods approaches, Bryman found the paradigm of pragmatism highly utilized. Bryman added weight

to the argument that pragmatism as a paradigm has given birth to increased use of mixed methodologies when research subjects are suitable.

Johnson and Onwuegbuzie (2004) agreed that the pragmatist paradigm and mixed-methods research is the natural compliment to traditional quantitative and qualitative research. They promote mixed methods as a third research paradigm in the social and behavioral sciences that is not intended to replace quantitative or qualitative methods, but to stand beside them. Johnson and Onwuegbuzie (2004) side-step the paradigm wars, and assert that it does not matter how those philosophical battles play out, because mixed methods research does not have to rely on either positivism or constructivism, it has its own paradigm in pragmatism; they describe the pragmatic approach of mixed methods as

> The third wave, a movement which moves past the paradigm wars by offering a logical and practical alternative… Mixed methods research also is an attempt to legitimate the use of multiple approaches in answering research questions, rather than restricting or constraining researcher's choices (i.e., it rejects dogmatism). It is an expansive and creative form of research…It is inclusive, pluralistic, and complimentary, and it suggests that researchers take an eclectic approach to method selection …What is most fundamental is the research question---research methods should *follow* research questions in a way that offers the best chance to obtain useful answers. (pp.17-18)

Greene (2005) also saw mixed methods research as a counterpoint to the debate about which paradigm is more rigorous or valid. Greene suggested that by welcoming all legitimate methodological traditions, mixed methods offers the potential to generate more insightful understanding of research questions.

In the present "peaceful" atmosphere conducive to the pragmatist paradigm and mixed methods (Bryman, 2006), Tashakkori and Teddlie (1998, 2003, in press) have offered three significant contributions to the advancement of this methodology in the social and behavioral sciences. The first (Tashakkori & Teddlie, 1998) was a book that serves as both an explication and typology of mixed methods research, and as a "how-to" guide on the conduct of mixed methodological studies. The second (Tashakkori & Teddlie, 2003) is a handbook which

continues with a deeper rationale and analysis of the advent of mixed methods research and mixed methods typologies, and situates this new methodology in the context of the evolution of all research methodology in the social and behavioral sciences. Beyond this, Tashakkori and Teddlie (2003) collected chapters from various researchers and educators elaborating the methodological and analytical issues for mixed methods research, as well as applications and examples of mixed methods research across disciplines. The third effort (Teddlie & Tashakkori, in press) is a deeper elaboration of the philosophical foundations of mixed methods, and a refinement of a typology of mixed methodologies in the larger context of all research methods, quantitative, qualitative, and mixed.

The fact that standard texts in the social and behavioral sciences (e.g., Creswell, 2002; Johnson & Christensen, 2004) have included mixed methods alongside quantitative and qualitative methodologies is testimony to the increasing acceptance of mixed methods and its pragmatic paradigm as a valid research choice.

The Link Between Paradigms and Methods

Guba and Lincoln (1988) tackled the question: do inquiry paradigms imply inquiry methodologies? Guba and Lincoln (1988) identified two disciplined methodologies (scientific and naturalistic) with the two principal inquiry paradigms. Guba and Lincoln (1988) maintained that these methodologies utilize a variety of methods (some methods used by both) in a manner which is distinctive to the paradigm and is based upon the underlying premises of either the scientific or naturalistic paradigm.

Patton (1988) also took up the issue of the connection between paradigms and methods. Patton compared the views of Guba and Lincoln (1988), who held that paradigms necessarily imply methods, with the views of Reichardt and Cook (1979) who argued that methods do not follow logically from paradigm distinctions. Patton (1988) concluded that method types are

typically (but not necessarily) linked to a paradigm, so that allegiance to a paradigm is usually, but not the only, basis for making methods decisions. Patton maintained that competing paradigms could not be reduced to contrasting methods, but that method distinctions "are the most concrete and practical manifestation of the larger, more overarching pragmatic frameworks" (Patton, 1988, p. 127).

In the case of qualitative research, Denzin and Lincoln (2000) maintained that the field and its paradigmatic bases are not easily categorized in clear paradigm to method connections. Denzin and Lincoln (2000) hold that many philosophical paradigms (e.g., positivism, constructivism and its variants, etc.) can support qualitative methods.

Noting researchers' tendency to confuse epistemology with methodology (Onwuegbuzie & Teddlie, 2003), Johnson and Onwuegbuzie (2004) also maintained that there is not often a clear link between epistemology and methodology. So, from at least the epistemological aspect of a paradigm, unique links to particular methodologies can rarely be drawn.

Lincoln and Guba (2005) tried to put these notions in perspective and state that while "inquiry methodology can no longer be treated as a set of universally applicable rules and abstractions," deriving from necessarily from particular paradigms, nevertheless "methodology is inevitably interwoven with and emerges from the nature of particular disciplines… and particular perspectives," (i.e., paradigms) (pp. 191-192). In other words there is a paradigmatic-methodological link, but it is not absolute.

Morgan (2007) took a broad look at the relationship between paradigms and methodologies, using Kuhn (1962, 1970) as the source of his arguments. Morgan proposed that there are four versions of what paradigms are and how they affect methods all based either explicitly or implicitly in Kuhn's (1962, 1970) original conception of paradigmatic development. The first version sees paradigms as worldviews, a very broad and imprecise definition according

to Morgan. The second version sees paradigms as epistemological stances, e. g. ontology and epistemology, which affect the approach to research. This second version is described by Morgan as the dominant paradigm in the discussion of research paradigms today. The third version, favored by Morgan, views paradigms as shared beliefs in a research field. This view is similar to the second, but is not limited to underlying philosophical principles, and extends to all the actual work done by researchers. The fourth version looks at paradigms as model examples of the best typical solutions to research problems.

Morgan (2007) argued that what he calls the "metaphysical paradigm" (the second version) has many shortcomings, principal among them that it never answers the question: What is the relationship between metaphysical beliefs and research practices? To answer this question, as well as resolve other difficulties he perceives in the metaphysical paradigm, Morgan offered an alternative he calls the pragmatic approach. This alternative builds upon two strengths of the other approaches: the importance of epistemological issues in social science research methodology, and the need to recognize the place of worldviews in the work of researchers. The pragmatic approach accomplishes these things by showing the connection of theory and data by using abduction in place of induction or deduction, proposing intersubjectivity as a stance opposed to the simple dichotomy of subjectivity and objectivity, and promoting transferability as an alternative to generalization or contexualtiy of conclusions.

Even though Morgan (2007) rejected the more common approach (the metaphysical paradigm) which claims broad philosophical underpinnings of research methodologies, his alternative approach nonetheless recognized that there are some connections between epistemology and research methods, and thus builds on a paradigm-methodology link.

Accepting that there are no absolute links between paradigms and particular methodologies, some authors (Creswell, 2003; Guba & Lincoln, 2005; Teddlie & Tashakkori, in

press) continue to identify broad paradigmatic categories with various methodologies. As mentioned above, the paradigm of pragmatism is seen as the driving impetus for the development and advancement of mixed methods research (Bryman, 2006; Johnson & Onwuegbuzie, 2004). Creswell (2003) also linked pragmatism with mixed methods, as well as generally categorizing constructivism with qualitative approaches and postpositivism with quantitative methods. Teddlie and Tashakkori (in press) follow an almost identical approach at generic classification. Guba and Lincoln (2005) were a little more expansive, loosely identifying positivism and postpositivism with experimental methods, critical theory with dialogic and dialectic approaches, and constructivism with what they call hermeneutical approaches.

The Research Continuum

In a text on educational research, which can be extended to apply to other social and behavioral disciplines, Creswell (2002) drew a number of distinctions between quantitative and qualitative research based on differences in approach to the research process. In terms of identifying a research problem, quantitative research is description and explanation oriented, qualitative is exploratory and understanding-oriented. Quantitative research utilizes specific, measurable, observable, and numeric data collected with predetermined instruments, while qualitative research is narrative data which is usually general and broad, and is collected with emerging protocols. Quantitative research makes use of statistical analysis, while qualitative uses description and thematic analysis. In terms of design, Creswell determined that quantitative designs are either experimental, correlational, or survey, with qualitative designs rooted in grounded theory, ethnography, or narrative research. At the same time, Creswell advocated the utility of mixed method design, which encompasses characteristics from both quantitative and qualitative designs. In this sense, Creswell recognized an overlap between quantitative and qualitative methodologies, which blurred polar distinctions between them.

Johnson and Christensen (2004) went beyond blurred distinctions, and asserted that the three research approaches exist on a continuum with qualitative research on one side, quantitative research on the opposite side, and mixed methods research in the middle. Johnson and Christensen also developed a detailed schedule which elaborated various characteristics of each of the three research approaches based on distinctions like logic, ontology, axiology, type of data, etc. Based on the specific components of a research approach, it could appear anywhere on the continuum between quantitative research at one end and qualitative research at the other. Those approaches falling near the middle of the continuum would properly be called mixed methodologies.

Teddlie and Tashakkori (in press) also support the idea of a research continuum, and also developed a detailed set of distinctions between quantitative, qualitative, and mixed methods research. Teddlie and Tashakkori (in press) identify fourteen general issues determining position on the research continuum. These issues are used to make distinctions that compare methodologies on the basis of paradigms and philosophical distinctions (i.e., axiology, epistemology, ontology, and logic), sampling (e.g., probability or purposive), design traditions e.g., experimental or ethnographic), data collection and analysis (e.g., qualitative versus statistical), and differences in concern with conclusions and inference (e.g., questions surrounding internal and external validity). These differences and distinctions are significant in the evaluation of research methodologies utilized in the various disciplines and are summarized in Table 2.2.

Summary

The review began with a definition of academic disciplines and then surveyed various frameworks that have been suggested for classifying disciplines based on various similarities and

Table 2.2

Teddlie and Tashakkori's Classification of Methodological Distinctions

General Issue	**Qualitative**	**Mixed Methods**	**Quantitative**
Questions/Hypothesis	Research Questions	Both	Research Hypotheses
Paradigms	Constructivism	Pragmatism	Positivism
Axiology	Inquiry is value bound	Value plays a role	Inquiry is value-free
Epistemology	Subjective	Subjective and Objective	Objective
Ontology	Relativism	Accept external reality	Realism
Logic	Inductive	Both	Deductive
Conceptual/Theoretical	Grounded Theory	Depends on approach	Based in Literature
Sampling	Purposive	Mixed Methods	Probability
Design Traditions	Ethnography, Grounded Theory, Phenomenology, Biography, Case Study	Mixed Methods Designs	Experimental Correlational Independent and Dependent Variables
Data Type	Narrative	Both; Data Conversion	Numeric
Data Analysis	Qualitative	Mixed	Statistical
Validity	Credibility	Inference Quality	Internal Validity
Generalizability	Transferability	Inference Transferability	External Validity
Reliability	Dependability	Inference Transferability	Construct Validity

Note: Adapted from *Foundations of Mixed Methods Research*, by C. Teddlie and A. Tashakkori, in press.

differences. Six foundations for classification were seen: paradigmatic development (Kuhn, 1962, 1970; Lodahl & Gordon, 1972), scholarly consensus (Hagstrom, 1964, 1965; Hargens

1975; Lodahl & Gordon, 1972), codification (Zuckerman & Merton, 1971, 1972), approaches based on organizational structure (Collins, 1975; Whitely, 1984), the cultural approach (Becher, 1989; Becher & Trowler 2001), and the Biglan model (Biglan, 1973a, 1973b).

Of the six classification systems, the Biglan (1973a, 1973b) system was shown as best suited as a conceptual framework for the study as it encompasses two of the other major schemes: paradigm development and scholarly consensus. Further, the Biglan model was shown to provide easily discernable groupings of disciplines. Such clearly defined groups are appropriate to answer the first research question about the differences between these groups based on their preference for quantitative, qualitative, or mixed methodologies.

Next, the review considered a number of empirical studies into the validity of various disciplinary classification schemes. Particular emphasis was given to studies seeking to verify the Biglan (1973a, 1973b) model. These studies showed that the Biglan system applied reasonably well across diverse institutional settings (Creswell & Roskens, 1981; Smart & Elton, 1975), could be expanded to encompass a multitude of disciplines (Malaney, 1986a; Stoecker, 1993), and was an appropriate framework to test various aspects of disciplinarity (e.g. Cashin & Downey, 1995; Creswell & Bean, 1981; Hargens, 1996; Paulsen & Wells 1998; Schommer-Aikens, et al., 2003). Among the many attempts at validating the Biglan (1973a, 1973b) system, none have yet considered differences in preferred research methodologies, giving a unique cast to the study as well as setting up the first research question.

Finally, the review considered research methodology and underlying research paradigms in the social and behavioral sciences. The evolution of three research methodologies (quantitative, qualitative, and mixed methods) was illustrated as well as the various components of those methods (Johnson & Christensen, 2004; Tashakkori & Teddlie, 2003). These components of design as well as methods of sampling, data collection, and data analysis form the

basis for comparison between the disciplinary groups to answer the second research question concerning the differences in frequency of used of particular components across the disciplinary groups.

The paradigmatic basis for research methodologies was established (Creswell, 2002, 2003; Johnson & Christensen, 2004; Teddlie & Tashakkori, in press). Although there is some dispute about the precise connection between philosophical paradigms and research methodologies (Morgan, 2007), some authors (Creswell, 2003; Guba & Lincoln, 2005; Teddlie & Tashakkori, in press) continue to identify broad paradigmatic categories with various methodologies. This identification between paradigm and methods is the basis for the third research question which asks if there are differences between the underlying paradigms across the disciplinary groupings.

CHAPTER 3: METHODS

Research Design

The approach of this study is a pragmatic one. It provides a straightforward means of characterizing the methodology of research in journal articles to facilitate comparison between disciplines and thereby evaluate the validity of the Biglan (1973a, 1973b) groups in this respect. This method involves the collection of qualitative data, which is then quantitized and quantitatively analyzed to provide answers for each of the three research questions:

(1) Are there significant differences in the use of quantitative, qualitative and mixed methodologies between pure and applied groups of disciplines in the soft/life groups of the Biglan classification?

(2) What are the frequencies of use of the various methodological components in each of the disciplinary groups in question, and are there significant differences in the use of these components between the groups?

(3) Can the underlying philosophical paradigms of disciplinary groups in the Biglan classification be identified in research articles and are there significant differences between the groups?

The practical approach of the study is described by Tashakkori and Teddlie (1998) as pragmatism, the philosophical paradigm founding the use of mixed methodology in research in the behavioral and social sciences. The method can further be described as a quasi mixed methods approach (Teddlie & Tashakkori, 2006), which is a way of describing the pragmatic use of qualitative data collection combined with quantitative analysis as a practical means of answering research questions.

The specific design for this study is based on the taxonomy of research method designs developed by Teddlie and Tashakkori (2006). Within the terminology utilized by and Teddlie

and Tashakkori, the model here is a quasi-mixed mono-strand design. The design is mono-strand because even though there are quantitative and qualitative elements in the design, there is only one data collection phase and one data analysis phase (i.e., a single strand of research).

The methodology involves utilizing primarily quantitative methods: probability sampling of articles and non-parametric statistical tests (Chi-Square) for data analysis. The research questions are all quantitative and answered quantitatively in terms of significant differences inferred between groups. However, the selection of journals from which articles were randomly chosen is purposive, a qualitative method. Furthermore, the instrument used for data gathering utilized a qualitative technique of coding. Teddlie and Tashakkori (2006) described this combination of methodology a quasi mixed design. That is, a design which is mixed only at the methodological/analytical stage of the study. For example, "researchers who are working with one approach primarily (e.g., the QUAN approach) might elect to gather and analyze data associated with the other approach (e.g., the QUAL approach)" (Teddlie & Tashakkori, 2006, p. 17). This is precisely the approach utilized in the methodology which is therefore quasi mixed, and, since it only has one strand, is accurately described as a quasi-mixed mono-strand design (Teddlie & Tashakkori, 2006).

Sampling Methods

Choice of Groups for Comparison

The Biglan (1973a, 1973b) clustering of academic disciplines on three contrasting criteria forms eight groups (see Table 1.1). The study focuses on two of these groups: soft/life/pure and soft/life/applied. The reason for focus on the soft/life classifications is that this area encompasses the behavioral and social sciences. The behavioral and social sciences are chosen for study because the literature provides rich description and scrutiny of their methodological and paradigmatic bases (Creswell, 2003; Tashakkori & Teddlie, 2003). Such description offers a

means of comparison between individual disciplines, and has been incorporated into the categories used to code the articles. For example, the growing use of mixed methodology in the behavioral and social sciences (Tashakkori & Teddlie, 2003; Teddlie & Tashakkori, in press) provides a fulcrum for comparison with both quantitative and qualitative methods used in these sciences. In order to define the elements of mixed methodology, the authors of various chapters in Tashakkori and Teddlie's *Handbook of Mixed Methods* (2003) also explicated the paradigms and methods supporting traditional quantitative methodologies, as well as qualitative methods. These explanations have assisted in formulating the operational definitions of categories to code research articles.

Furthermore, the social and behavioral sciences are an area of interest for study because possible differences in preferred research methods are not intuitively evident. For example, based on simple observation it is less clear that there may be significant differences in the research methodology of psychology (soft/life/pure) and educational administration (soft/life/applied) than there may be between physics (hard/nonlife/pure) and educational administration (soft/life/applied). To test the validity of the Biglan (1973a, 1973b) classification system, the comparison of groupings with the most similarities provides stronger inference if differences are revealed in the data analysis.

Selection of Disciplines for Study

For the study, two disciplines are selected from the soft/life/pure and two from soft/life/applied groupings of disciplines. Biglan (1973a, 1973b) validated only four disciplines each in the soft/life/pure and soft/life/applied classifications. In the soft/life/applied group, Biglan (1973a, 1973b) considered only various educational fields (see Table 1). This makes for a rather monolithic grouping, and so other disciplines known to fall within the soft/life/applied group were sought. Even though there have been numerous empirical studies attempting to

validate the Biglan (1973a, 1973b) scheme, only two have sought to expand the number of disciplines included in the classification (Malaney, 1986a; Stoecker, 1993). Stoecker (1993) did succeed in validating some additional disciplines as belonging to the various Biglan (1973a, 1973b) groupings. Malaney (1986) also grouped a large number of additional disciplines into the Biglan (1973a, 1973b) classification scheme.

Stoecker (1993) showed that Nursing clearly belonged in the soft/life/applied group according to the Biglan (1973a, 1973b) criteria. Although Malaney (1986) added a number of disciplines to the soft/life/applied group, the only one in common with Stoecker (1993) was Nursing. Therefore Nursing was chosen as a discipline to study as a validated part of the soft/life/applied group.

Education was the other discipline selected to represent the Biglan (1973a, 1973b) soft/life/applied group. Biglan's grouping encompasses four educational disciplines: Educational Administration, Secondary Education, Special Education, and Vo-Tech Education. The discipline of Education was also generally validated as a part of the soft/life/applied group by both Stoecker (1993) and Malaney (1986). Since no other disciplines were commonly grouped in the soft/life/applied classification by Biglan (1973a, 1973b), Malaney (1986), or Stoecker (1993), the study is limited to Nursing and Education.

For the soft/life/pure group, Biglan (1973a, 1973b) gave the disciplines of Anthropology, Political Science, Psychology, and Sociology (see Table 1.1). Both Malaney (1986) and Stoecker (1993) included all four disciplines in their groupings. Malaney (1986) added Black Studies, and Stoecker (1993) added Theology, but they have no common additions.

In order to balance the choice of two disciplines representing the soft/life/applied group, two disciplines were purposively chosen from the four disciplines in the soft/life/pure grouping common to Biglan (1973a, 1973b), Malaney (1986), and Stoecker (1993). The purposeful

sampling technique used is typical case sampling (Patton, 2002), because the objective in choosing disciplines from this small group was to represent the methods of empirical research typical of this group. The four disciplines Biglan (1973a, 1973b) placed in this group (see Table 1.1) all investigate the human condition and behavior, but an informal survey of research journals for this study revealed that the disciplines of Psychology and Sociology publish more empirical research than the other two. Therefore, Psychology and Sociology were chosen as providing the richest source of examples of the kinds of empirical research typically done in the soft/life/pure grouping.

Selection of Journals and Journal Articles

The unit of analysis in this study is articles from research journals in each of the disciplines selected. The sampling method applied to the selection of journals is stratified purposive sampling (Patton, 2002). The journals were purposively chosen to each represent a discipline. Journal selection was stratified in disciplines grouped according to the Biglan (1973a, 1973b) classification, with each of the two groupings representing a stratum. Therefore, journals were chosen from the disciplines of Psychology and Sociology to represent the soft/life/pure stratum, and journals selected from Education and Nursing represent the soft/life/applied stratum.

The method of selecting journals which are representative of their discipline utilizes statistical data provided by *Journal Citation Reports: Social Sciences Edition* (2005). In order to objectively choose journals that publish research recognized by fellow researchers as significant to the work of a discipline, a combination of Impact Factor and Total Citations statistics from *Journal Citation Reports: Social Sciences Edition* (2005) was utilized. Total Citations indicates the popularity of a journal based on how many times it is cited in other journals; Impact Factor helps to evaluate a journal's relative importance, especially when compared to others in the same

field (*Journal Citation Reports: Social Sciences Edition,* 2005). Using a simple multiple factor of Total Citations and Impact Factor to create an index combines the most popular journals (Total Citations) and the most important ones to research in the discipline (Impact Factor). For example, in the field of Nursing the *Journal of Advanced Nursing* has an Impact Factor of 0.912, and total citations of 4540 (*Journal Citation Reports: Social Sciences Edition,* 2005). To index this journal, one multiples 0.912 times 4,540 yielding multiple factor of 4,140; this is then used to compare the Journal of Advanced Nursing to other journals in the field. As it happens, the *Journal of Advanced Nursing*'s multiple factor or 4,140 is the highest in the Nursing field. By way of contrast, the second ranked journal, *Nursing Research*, has a higher Impact Factor (1.528), but much lower Total Citations (1,904), and yields a multiple factor of only 2,909.

In this way, the journals selected can be considered the typical ones (i.e., those most used) and therefore the ones that could most lay claim to being preferred by the majority of researchers in the discipline. Such a choice is important because the study uses a conceptual framework which groups disciplines on their most common characteristics. The Biglan (1973a, 1973b) groups are not completely and mutually exclusive, but work as a classification system because they represent broad, verifiable similarities and differences between disciplines.

Once an index of journals ranked by Total Citations and Impact Factor was created, journals that publish primarily review articles were eliminated since the purpose of the study is to compare the methods utilized in original empirical research. After establishing which of the highest ranked journals in each discipline publish primarily empirical research, the top five from each of the four disciplines were selected to provide articles as the sample for the study. The complete list of journals by discipline and ranked by the multiple factor are shown in Table 3.1.

Articles from the purposively stratified sample of journals were selected by systematic random sampling. Once research articles had been isolated from other types of articles, every n^{th}

Table 3.1

Disciplinary Journals Ranked by Multiple Factor

Rank	Journal	Multiple Factor
	Nursing	
1	Journal of Advanced Nursing	4140
2	Nursing Research	2909
3	Research in Nursing & Health	1503
4	Cancer Nursing	1009
5	Journal of Clinical Nursing	888
	Education	
1	American Educational Research Journal	1545
2	Journal of Research in Science and Teaching	1346
3	Journal of the Learning Sciences	1120
4	Reading Research Quarterly	856
5	Learning and Instruction	817
	Sociology	
1	American Sociological Review	21147
2	American Journal of Sociology	20188
3	Journal of Marriage and the Family	5685
4	Social Forces	3735
5	Social Problems	2539
	Psychology	
1	Journal of Personality and Social Psychology	114615
2	Journal of Consulting and Clinical Psychology	60132
3	Journal of Abnormal Psychology	35548
4	Journal of Applied Psychology	25168
5	Developmental Psychology	25117

Note: From *Journal Citation Reports: Social Sciences Edition* (2005).

article was randomly selected for coding. The number of articles systematically skipped in this random sample varied from journal to journal depending on the density of research articles. For example, in the *Journal of Advanced Nursing*, every 5th article was selected because of a high density of research articles to the other six types of articles. On the other hand, in the *American Sociological Review*, every 2nd research article was systematically selected because of a low density of research articles relative to other types of articles in that journal. Varying the range of systematic random samples in this fashion allowed for a comparable range of journals sampled in

each discipline. The articles thus selected represent a cross-section of all the articles published in each of the articles which focuses on journal year 2005 and immediately before. Table 3.2 shows the range of years sampled from each journal as well as the publisher of each journal.

Table 3.2

Years Sampled and Publishers of Disciplinary Journals

Journal	Publication Years Sampled	Publisher
Nursing		
Journal of Advanced Nursing	2005	Blackwell
Nursing Research	2004-2005	Wolters Kluwer
Research in Nursing & Health	2004-2005	Wiley
Cancer Nursing	2004-2005	Wolters Kluwer
Journal of Clinical Nursing	2004-2005	Blackwell
Education		
American Educational Research Journal	2003-2005	American Educational Research Association
Journal of Research in Science and Teaching	2004-2005	Wiley
Journal of the Learning Sciences	2001-2005	International Society of the Learning Sciences
Reading Research Quarterly	2003-2005	International Reading Association
Learning and Instruction	2003-2005	Elsevier
Sociology		
American Sociological Review	2004-2005	American Sociological Association
American Journal of Sociology	2003-2005	University of Chicago
Journal of Marriage and the Family	2005	Blackwell
Social Forces	2004-2005	Southern Sociological Society
Social Problems	2003-2005	Society for the Study of Social Problems
Psychology		
Journal of Personality and Social Psychology	2005	American Psychological Association

(Table 3.2 continued)

Journal of Consulting and Clinical Psychology	2005	American Psychological Association
Journal of Abnormal Psychology	2004-2005	American Psychological Association
Journal of Applied Psychology	2004-2005	American Psychological Association
Developmental Psychology	2004-2005	American Psychological Association

Sample Size

In choosing a sample size for the study, first consideration was given to the elements of power, significance level, and effect size. Following conventional parameters for inferential statistics, a significance level of .05 and a power of .80 were set a priori. Within these parameters, it was desired that the results of the statistical tests be able to detect a small to medium effect size. The most important comparison between the soft/life/pure and soft/life/applied disciplines was across quantitative, qualitative, and mixed methods, and this comparison has two degrees of freedom. Utilizing power tables for Chi-Square analysis provided by Aron, Aron, and Coups (2006), with .80 power at the .05 significance level and 2 degrees of freedom, a sample 964 is needed in order to detect a small effect size. A sample of 107 can detect a medium effect size. Therefore a sample between approximately 100 and 900 can detect a small to medium effect. Sample size goes up with more degrees of freedom, but most of the tests required to answer the research questions have four or five degrees of freedom, and sample size required there ranges between 133 for medium effect size and 1,194 for a small effect size. Therefore in all cases for the research questions asked, a sample size between

approximately 100 and 1,000 should detect a medium to small effect with .80 power and a significance level of .05.

A greater issue utilizing Chi-Square tests is that this procedure requires an expected frequency in each cell of no less than five in order for the test to be accurate. The smallest cells to answer the first research question looking for a difference between quantitative, qualitative, and mixed methods was in the mixed methods column. Since the expected value in any cell is equal to the row total times the column total divided by the sample total, simple math for a two row by three column table (the size table needed to answer the first research question) shows that to produce an expected value of five in each cell requires the smallest column total ten. The conclusion is that at least 10 mixed method studies are required from the total sample comparing articles utilizing quantitative, qualitative, or mixed methods. In a pilot study conducted in preparation for the study, a total of six mixed methods articles were found in a total sample of 73. Based on this finding, a total of ten mixed methods articles could reasonably be expected from a sample as small as 150.

Three factors favor a sample size larger than 150. First, as mentioned above, a sample of 150 would just detect a medium effect size. A sample size larger than 150 and up to 1,000 increases the chance of detecting a smaller effect.

Second, in the tests to answer the second and third research questions (for example a comparison of research paradigms) all expected cell values still need to be five or greater. Again, based on the pilot study results, several hundred articles would be sampled in order to maintain adequate cell size.

Third, with 20 journals selected (five from each of the four disciplines), a larger number of articles are necessary to have a fair sample of each. Experience in the pilot study revealed a

sample of at least 20 articles from a single journal was necessary to adequately represent the research content of the journal.

Based on all the above rationales, 30 research articles were systematically randomly selected from each of the top five journals in the four chosen disciplines. This yielded a total of 150 articles from each discipline and a total of 300 from each Biglan (1973a, 1973b) group, for a grand total of 600 articles. This sample size fulfills standard power and effect size requirements (Aron, Aron, & Coups, 2006; Cohen, 1988), and also maintains a minimum expected value of five in all cells of all test tables used to answer the research questions.

Data Collection Procedures Using the Content Analysis Code Sheet

The data collected from the research journal articles was pieces of information about methodologies. Specific uses and indicators of methods present in the research, which are characteristic of a specific methodology, were recorded for each article. The method of recording this data was content analysis based on a code sheet specifically developed for this purpose.

Content Analysis

Content analysis can be described as "the study of recorded human communications" (Babbie, 2002, p. 312). More specifically, content analysis is a technique utilized in this study to analyze narrative data in a qualitative fashion. In particular, the "human communications" or narrative data to be analyzed are research journal articles.

Content analysis is typically classified as either manifest or latent (Babbie, 2002; Berg, 2004; Tashakkori & Teddlie, 1998). Latent content analysis is a technique used to develop emerging themes from narrative data, and is determined by a subjective evaluation of the overall content of the narrative (Tashakkori & Teddlie, 1998). Manifest content analysis establishes a priori categories, or a coding system, and then codes narrative data based on these categories.

The study, therefore, uses the technique of manifest content analysis to code the research journal articles. The a priori categories used for coding are described in detail in the following sections which give operational definitions for all categories used. It should be noted that although the coding described here is a qualitative process (manifest content analysis) the qualitative data thus collected (the a priori categories present in the research articles) were then transformed into numeric data for quantitative data analysis to answer the research questions.

The Code Sheet

A code sheet for the study is presented in the Appendix. The sheet records basic information about the article including the discipline, journal name, article citation, and topic. This is followed by a designation of the type of article. The designation of quantitative, qualitative, or mixed methodological article is dependent on first coding various indicators of method.

Indicators of the methodological nature of a research article are the overall research design (according to the categories shown in the Appendix differentiating quantitative and qualitative designs), sampling methods (probabilistic, purposeful, convenience, or a combination), data collection methods (e.g., questionnaire or interview), data types (numeric, narrative, or mixed), and the type of data analysis (quantitative, qualitative, or mixed). The underlying philosophical paradigm (e.g., positivism, constructivism, etc.) for the methodology is also recorded. This designation is based on the philosophical foundations of each paradigm (logic, axiology, epistemology, and ontology) to the extent they are evident in the article. In as much as these philosophical elements can be ascertained, they bolster the designation of each article as having its basis in a particular paradigm.

In order for the coding to be credible, precise and consistent operational definitions are necessary for each of the categories coded. The consistency and dependability of the article

analysis was enhanced through the use of the inquiry audit technique (Lincoln & Guba, 1985). Niglas (2004), and to a lesser extent Hutchinson and Lovell (2004), followed this method of providing exact operational definitions of the methods indicators coded. In this way the neutrality and lack of bias of the research is indicated, assuring the confirmability of results.

Type of Article

Articles were initially classified in one of seven possible types: expository, expository supported by data, opinion/position or theoretical paper, historical review, informational articles, book review, or empirical research article. The empirical research articles were further distinguished as a qualitative study, quantitative study, or mixed methodological study on the code sheet. The core of these classifications was adapted from the scheme developed by Hutchinson and Lovell (2004). Hutchinson and Lovell's (2004) categories worked well in characterizing articles in higher education journals and are expected to categorize equally well research articles in other social and behavioral sciences, since this group of disciplines has a common history and base in research methodology (Teddlie & Tashakkori, 2003). Even though the expository, historical review, informational, book review, and opinion/theory articles are not research per se, and did not enter into the data analysis phase of the study, they serve to provide a descriptive picture of the types of articles appearing in research journals across the disciplines studied. Hutchinson and Lovell (2004) based their definitions on their own experience and expertise as well as standard methods texts including those of Creswell (2002) and Krathwohl (1998). The following operational definitions for expository, opinion/theory, and historical review articles are the ones defined by Hutchinson and Lovell (2004, pp. 388-390).

Expository articles are those which address an issue primarily through a review of the literature. Expository articles with data support are those which are primarily expository in nature but which included some data (e.g. tables or graphs from secondary sources) used to

support the author's argument. The primary distinction between data supported expository articles and a true qualitative or quantitative study is that the data and data analysis are not primary. Data supported expository articles provide no evidence of data collection or data analysis procedures.

Opinion/theory or position articles are those which reflect the views of the author and often tend to be of an editorial nature. These articles typically do not include any data or data analysis or refer to it only anecdotally. Often these articles suggest a theory or untested hypothesis of the author, but which differ from expository articles through a lack of foundation in the literature. These articles may also take the form of commentary on previously published research articles.

Historical reviews refer to articles describing some past phenomenon, but which have no stated design or methodology. These are distinguished from qualitative studies based on historical design in that the latter delineate data sources and methods. In this sense, historical reviews are essentially expository in nature but offering an historical perspective.

Book reviews are self-explanatory. Informational articles are short journal articles which may touch on various issues such as journal contents, editorial policies, journal themes, or other information to provide the reader with context for a particular journal, volume, or issue.

Both qualitative and quantitative studies are primarily distinguished from the other article types by the inclusion of original empirical research. Such articles include descriptions of participants and data sources, data collection methods, and data analysis procedures. The coding of articles in particular as quantitative or qualitative was determined by further coding of the research design, paradigm, sampling methods, data collection methods, data types, and data analysis methods, each of which was characterized as representing qualitative or quantitative research.

Mixed methodological studies are those which either specifically state their design as mixed or which possess in the study an admixture of methods which are identified as both qualitative and quantitative (Tashakkori & Teddlie, 2003, p. 711). Niglas' (2004) criterion was that unless an article possesses exclusively qualitative or quantitative methods (i.e., in all the categories coded: design, sampling, data collection, data types, data analysis) it would be coded as a mixed methodological study. The pilot study done prior to the present study showed this definition was too rigid in categorizing articles as mixed methodologically. Therefore, for the purpose of the study, only an article which possesses a high degree of integration of both quantitative and qualitative methods was considered a mixed methodological study, even if the research design is apparently qualitative or quantitative. A high degree of integration is defined as having more than one of the categories of sampling, data collection, data type, and data analysis being a heterogeneous mixture of quantitative and qualitative methods.

Research Designs

Quantitative

Creswell (2002) offered a concise but fairly complete definition of quantitative research design:

> Quantitative research is an inquiry approach useful for describing trends and explaining the relationship among variables found in the literature. To conduct this inquiry, the investigator specifies narrow questions, locates or develops instruments to gather data to answer the questions, and analyzes numbers from the instruments using statistics. From the results of these analyses, the researcher interprets the data using prior predictions and research studies. The final report, presented in a standard format, displays researcher objectivity. p.58)

This type of research can be further characterized utilizing categories developed by Creswell (2002, 2003), Hutchinson and Lovell (2004), Johnson and Christensen (2004), Krathwohl (1998), and Tashakkori and Teddlie (2003) identifying quantitative research articles as those which are experimental, correlational, or survey in their methodological design.

Experimental designs (also known as intervention studies or group comparison studies) are quantitative designs in which the researcher determines the impact of an intervention on an outcome for a group in a study (Creswell, 2002). More often than not, the experiment is couched in terms of the effect of an independent (treatment) variable upon a dependent one. To the extent that it is possible the more specific type of experimental design was also recorded. These types include true versus quasi-experimental designs. The difference between true experiments and quasi-experiments is in the assignment of units of analysis to the various groups being studied. In true experimental designs there is a random assignment of subjects to groups, whereas in quasi-experimental designs the assignment is not random but selective for various reasons, e.g. the necessity of using existing groups in a study (Creswell, 2002; 2003). Experimental designs (true or quasi) may also be between or within group designs, factorial designs, repeated measures, time series, etc. as defined in standard texts such as those by Creswell (2002; 2003), Johnson and Christensen (2004), Krathwohl (1998), and Tashakkori and Teddlie (2003).

Correlational designs use a correlational statistical technique to describe and measure the degree of association between two or more variables. There is no attempt to control or manipulate variables in a correlational design, but a relationship is established using the correlation statistic between two or more variables in order to explain the relationship or predict outcomes (Creswell, 2002).

Causal comparative designs, like correlational designs, are non-experimental designs in which there is no manipulation of the independent variable. The difference between causal comparative designs and correlational designs is in the type of independent variable. Causal comparative designs use a categorical, or discrete, independent variable, while correlational designs employ a quantitative, or continuous, independent variable (Johnson & Christensen,

2004). In practice many research studies cross over between these designs when there is more than one independent variable, with one or more being categorical and the other(s) being continuous. In designs that Johnson and Christensen (2004, p. 331) call "simple," i.e. only one independent variable, if the variable is categorical the study was coded causal comparative, and if the variable is continuous it was coded correlational. In the event that a study uses both, both were checked on the code sheet, with the predominate design noted. The predominate design was the one which correlated more variables in the case of multiple independent variables. In any of the three possibilities, however, the design was considered quantitative.

Survey designs involve the administration of a survey or questionnaire to a sample in order to describe the attitudes, opinions, behaviors, or characteristics of a population. Statistical analyses can then be performed on the survey results which include the variables in questions or groups of questions on the instrument. It should be noted that correlational statistical techniques may be used in surveys, but survey design is distinguished from correlational design by the survey mode of data collection (questionnaire) and a survey's particular intent to describe behavioral characteristics of a population as described above. Surveys can be over time (longitudinal) or a study of a point in time (cross-sectional). Longitudinal studies attempt to establish trends in the population, while cross-sectional studies make comparisons between and assessments of groups (Creswell, 2002).

Qualitative

Similar to his definition of quantitative research, Creswell (2002) also gave a nutshell definition of qualitative research:

> Qualitative research is an inquiry approach useful for exploring and understanding a central phenomenon. To learn about the phenomenon, the inquirer asks participants broad, general questions, collects the detailed views of participants in the form of words or images, and analyzes the information for description and themes. From this data, the researcher interprets the meaning of the information, drawing upon personal reflections

> and past research. The final structure of the final report is flexible, and it displays the researcher's biases and thoughts. (p. 58)

Creswell's (2002) definition is very broad, and certainly not all-inclusive. Qualitative research over the last century has evolved and is a multi-faceted endeavor which Denzin and Lincoln (2005b) describe as a having a "methodologically contested present" and "fractured future" (p.3). The purpose of the study is in part to characterize research articles as qualitative because they belong to a particular research tradition. For this reason a simplified, if not comprehensive, typology of qualitative research designs was developed, which includes research designs common to the social and behavioral sciences included in the study. The typology of qualitative designs is based largely on the typology developed by Creswell (1998, 2002, 2003).

For the purposes of this study, the general design types of qualitative studies were coded in six primary categories: ethnography, case study, narrative, phenomenological, grounded theory, and critical-action-participatory. This particular selection of types is supported by Creswell (1998, 2002, 2003), Denzin and Lincoln (2005b), Guba and Lincoln (2005), and Johnson and Christensen (2004). Creswell (1998) cited nine other authors from various disciplines in the social and behavioral sciences who categorize qualitative traditions, and, pointing out substantial agreement between them, provides a convincing rationale for the first five types mentioned representing the majority of qualitative research approaches. To these five types is added a design termed critical-action-participatory, based on emerging qualitative research designs highlighted by Creswell (2002), Denzin and Lincoln (2005b), and Guba and Lincoln (2005).

Ethnography is traditionally defined as "the discovery and comprehensive description of the culture of a group of people" (Johnson & Christensen, 2004, p. 369). Ethnographic designs are "qualitative research procedures for describing, analyzing, and interpreting culture-sharing groups shared patterns of behavior, beliefs, and language that develop over time" (Creswell,

2002, p. 481). Ethnographic designs originated in several disciplines, including anthropology and sociology (Creswell, 1998). Ethnography is different from other qualitative techniques primarily in its focus on culture, and in its almost exclusive utilization of observation and interviews in fieldwork for data collection (Creswell, 1998, 2002; Johnson & Christensen, 2004; Schwandt, 2001). Ethnographic fieldwork often follows a determined sequence (Schwandt, 2001; Tashakkori & Teddlie, 1998) such as the developmental research sequence for participant observation designed by Spradley (1980).

A case study can be defined simply as "research that provides a detailed account and analysis of one or more cases" (Johnson & Christensen, 2004, p. 376). More fully, it is an "exploration of a bounded system or a case (or multiple cases) over time through detailed, in-depth data collection involving multiple sources of information rich in context," and the "multiple sources of information" include observations, interviews, audio-visual materials, documents and reports (Creswell, 1998, p. 61). Key to these definitions of case study is the explication of a "case" involving a program, event, an activity, or individuals (Creswell, 1998, p. 61) as a "bounded system" (Johnson & Christensen, 2004, p. 376) which implies being bounded by time and place. Case studies were first employed in various social sciences, including political science and sociology (Creswell, 1998).

Case studies may take on at least three variations in research design: intrinsic, instrumental, or collective (Johnson & Christensen, 2004). Intrinsic case studies are those that focus on a specific case in the classic single case design. Collective case studies use multiple cases studied together to provide insight into one research topic. Finally, instrumental case studies are those in which a researcher studies one or multiple cases with the primary interest being something more general than the particular case or cases. Instrumental case studies "are

popular with many academic researchers when they are interested in generalizing and extending the findings in research literatures on various topics" (Johnson & Christensen, 2004, p. 378).

Historical research "is the process of systematically examining past events or combinations of events to arrive at an account of what has happened in the past" (Johnson & Christensen, 2004, p. 392). Biographical research is "the study of an individual and his or her experiences as told to the researcher or found in documents or archival material" (Creswell, 1998, p. 47). In these terms biographical research is simply historical research that is focused on a person rather than an event. For this reason, the two are grouped together for coding research articles. Both forms of research are referred to as "narrative" design (Creswell, 2002, p. 522; 2003, p. 15) because in the case of an event (or series of events) or an individual (in biographical research) the researcher writes a narrative drawn from interviews, personal accounts, documents, and other historical sources to provide a dynamic account of past events that "attempts to capture the complex nuances, individual personalities, and ideas" that influence the people or events being studied (Johnson & Christensen, 2004, p. 392). Narrative research has its origin in the disciplines of history and anthropology, among others (Creswell, 1998).

A phenomenological research study attempts to "describe one or more individuals' experiences of a phenomenon" with the purpose in mind of obtaining a "view into your research participants' life-worlds and to understand their personal meanings...constructed from their lived-experiences" of a particular phenomenon, e.g., the experience of the death of a loved one, or being in a minority group (Johnson & Christensen, 2004, pp. 364-365). Data collection for a phenomenological study normally involves in-depth interviews with up to ten people, which is then analyzed with a listing of significant statements and a determination of the meaning of these statements to identify the essence of the phenomenon (Creswell, 1998; Johnson & Christensen,

2004). Phenomenology originated as a philosophical movement which took hold as a research method in the disciplines of sociology and psychology (Creswell, 1998).

In grounded theory research, the "researcher attempts to derive a general, abstract theory of a process, action, or interaction grounded in the views of the participants in the study" (Creswell, 2003, p. 14). Different from phenomenological research, which emphasizes the meaning of an experience for a number of individuals, "the intent of a grounded theory study is to generate or discover a theory, an abstract analytical schema of a phenomenon, that relates to a particular situation" (Creswell, 1998, p. 57). Data are therefore normally collected from 20 to 30 individuals until a saturation point is reached in which no new further information is being uncovered. These data (normally narrative from interviews) are then processed through a standard method of constant comparative analysis that involves open, axial, and selective coding. From this analysis, a theory is developed which seeks to explain a substantive topic or phenomenon. This standard formula for grounded theory research is affirmed by Creswell (1998, 2002), Johnson and Christensen (2004), and Schwandt (2001). Grounded theory was first utilized in sociological research, and has been adopted across many disciplines as a research method (Creswell, 1998).

Critical-action-participatory research is a term coined to include a wide variety of emerging research methods, including designs like critical ethnology (Denzin & Lincoln, 2005b), practical and participatory action research (Creswell, 2002), and policy analysis (Stage & Manning, 2003). The key identifier of this type of research design is the fact that it uses elements of traditional designs (the first five above), but tends to depart from them to the extent it is necessary for the research to affect opinion, action, or change (Creswell, 2002). Kemmis and McTaggart (2005) identify participatory research as an alternative research design with three particular attributes distinguishing it from traditional qualitative research designs: ownership of

research projects, analysis of social problems, and orientation toward action. Critical action research expresses a commitment to change and improve things. It is also strongly committed to participation and the social analyses of the critical social science tradition (Kemmis & McTaggart, 2005). It has its origins in educational action research (Creswell, 2002), and has also been utilized to take account of disadvantage attributable to gender, ethnicity, and social class (Kemmis & McTaggart, 2005).

Mixed Methods

As stated above, research articles were coded as employing mixed methodology if they employed an integral mixture of quantitative and qualitative methodologies in sampling, data collection, data type, or data analysis. It is also possible that research articles possess an explicit mixed method design. In all cases they were coded according to a typology of research designs featuring mixed methods developed and refined by Teddlie and Tashakkori (2006). The choice of this design typology was guided by the fact that Teddlie and Tashakkori have been at the forefront in developing a mixed methods typology (Tashakkori & Teddlie, 2003; Teddlie & Tashakkori, 2005, 2006, in press), and have repeatedly developed and refined their own model based on the previous models of others (Creswell, Plano-Clark, Gutmann, & Hanson 2003; Greene and Caracelli, 1997; Morse, 1991, 2003; Patton, 2002). As such, Tashakkori and Teddlie's (2006) typology represents a synthesis of their own and others models of categorizing mixed methods designs.

Teddlie and Tashakkori developed a "Methods-Strands Matrix" (2006, p.12) which includes traditional monomethod designs, but also features mixed methods research designs. Table 3.3 reproduces the matrix developed by Teddlie and Tashakkori (2006). The code sheet (Appendix) for the study utilizes the categories in cells three and four of the matrix to categorize mixed methods designs.

Table 3.3

The Methods-Strands Matrix: A Typology of Research Designs Featuring Mixed Methods

Design Type	Monostrand Designs	Multistrand Designs
Monomethod	**Cell One**	**Cell Two**
Designs	Monomethod Monostrand	Monomethod Multistrand
	(1) Traditional QUAN design	(1) Concurrent Monomethod
	(2) Traditional QUAL design	a. QUAN+QUAN b. QUAL+QUAL
		(2) Sequential Monomethod
		a. QUAN→QUAN b. QUAL→QUAL
Mixed Methods	**Cell Three**	**Cell Four**
Designs	Quasi-Mixed Mono-Strand:	A) Mixed Methods Multistrand
	Monostrand Conversion	(1) Concurrent Mixed
		(2) Sequential Mixed
		(3) Conversion Mixed
		(4) Fully Integrated
		B) Quasi-Mixed Multi-Strand: Mixed at the Experiential Stage Only

Note: From "A general typology of research designs featuring mixed methods," by C. Teddlie and A. Tashakkori, 2006, *Research in the Schools 13* (1), p. 15.

Four criteria are used in determining place in the methods-strands matrix (Teddlie & Tashakkori, 2006). First is the number of methodological approaches used: either one (qualitative or quantitative) or both. Use of one method gives rise to monomethod design in which only one approach is used across all stages of the study (cells one and two of the matrix).

Use of both quantitative and qualitative approaches qualifies as a mixed methods design (cells three and four of the matrix in Table 3.3).

The second criterion is the number of strands or phases in the study: does the study have one strand or multiple strands? This determination defines the monostrand or multistrand status of the design. A strand of research design has three stages: conceptualization (formulation of research questions), experiential (methodology), and inferential (inferences, explanations, and understandings). Monostrand designs employ only a single phase which encompasses all stages. Multistrand designs employ more than one phase, each phase encompassing all of the stages (Teddlie & Tashakkori, 2006). The matrix in Table 3.3 shows monostrand designs in cells one and three; multistrand designs are in cells two and four.

The third determining factor is the type of implementation process in the study (i.e., will the quantitative and qualitative data collection occur sequentially or concurrently, and will data conversion occur). This criterion only applies to multistrand designs, as seen in cells two and four of Table 3.3. Sequential and concurrent uses of methods are self-explanatory. Conversion designs are mixed methods designs which employ some type of data conversion. This can be "quantitizing" data: converting narrative data into numbers, or "qualitizing" data: transforming quantitative data into a form that can be analyzed qualitatively (Teddlie & Tashakkori, 2006, p. 17).

The fourth criterion is the stage of integration of approaches. That is, does integration of quantitative and qualitative methods occur in the experiential (methodological/analytical) stage only, or does it occur across all stages (conceptualization, experiential, and inferential) of the research strand. Those studies where the integration occurs only in the methodological/analytical stage are called "quasi-mixed" designs, and appear in cells three and four of the matrix of Table 3.3 (Teddlie & Tashakkori, 2006, p. 17). The quasi-mixed design

stands in contrast to the fully integrated design (see Table 3.3, cell four), which is a multistrand concurrent design in which the mixing of quantitative and qualitative approaches occurs interactively and across all stages of the study (Teddlie & Tashakkori, 2006, p. 23).

To reiterate, the code sheet (Appendix) attempted to capture mixed methods designs as represented in cells three and four of the research designs matrix presented in Table 3.3.

Research Paradigms

Denzin and Lincoln (2005a) provided a very succinct definition of a paradigm "as a basic set of beliefs that guide action. Paradigms deal with first principles, or ultimates. They are human constructions. They define the worldview of the researcher" (p. 183). Guba and Lincoln (1988) were among the first to point out that there is a clear link between the paradigmatic foundations of research and research methodologies. Denzin and Lincoln (2000) later indicated that the field of qualitative research and its paradigmatic bases are not easily categorized in clear paradigm to method connections: "A complex, interconnected family of terms, concepts, and assumptions surround the term *qualitative research*. These include the traditions associated with foundationalism, positivism, postfoundationalism, post-positivism, postconstructuralism, and the many qualitative research perspectives, and/or methods, connected to cultural and interpretive studies" (p. 2). Nevertheless, Lincoln and Guba (2005) still recognized in the midst of this complexity that while "inquiry methodology can no longer be treated as a set of universally applicable rules and abstractions," nevertheless "methodology is inevitably interwoven with and emerges from the nature of particular disciplines (such as sociology and psychology) and particular perspectives (such as Marxism, feminist theory, and queer theory)" (pp. 191-192). Schwandt (2001) elaborated further that the term "research paradigm" refers to "a disciplinary matrix---commitments, beliefs, values, methods, outlooks, and so forth shared across a discipline" (pp. 183-184). In this way, the paradigm that governs a discipline "guides the

researcher in philosophical assumptions about the research and in the selection of tools, instruments, participants, and methods used in the study" (Ponterotto, 2005, p. 128).

Several authors (Denzin & Lincoln, 2005b; Teddlie & Tashakkori, 2003) have pointed out that a strict linking of paradigm to method on a one-to-one basis creates problems dealing with the so-called "incompatibility thesis" (Teddlie & Tashakkori, 2003, pp. 18-19), which maintains mixed methods are impossible because they utilize incompatible paradigms. Nevertheless, the incompatibility thesis has been largely discredited (Teddlie & Tashakkori, 2003), and the fact that multiple paradigms may support a single methodology (Teddlie & Tashakkori, 2003) does not preclude developing a typology which seeks to elaborate the most common links between paradigmatic foundations and research methodologies (Creswell, 1998).

Therefore, given the links asserted between paradigms and disciplinary methods (Lincoln & Guba, 2005; Ponterotto, 2005; Schwandt, 2001), even though such links are not always clear cut (Denzin & Lincoln, 2005b), and even though multiple paradigms may support a methodology (Teddlie & Tashakkori, 2003), the study attempts to categorize articles by their underlying paradigmatic basis. To the extent that it is possible in a given research article, the research paradigm was recorded, based on the noted presence of designated elements of that paradigm (e.g., epistemology or ontology).

In order to ease paradigmatic identification of research articles, a simplified and broad typology of four paradigms is utilized. The four paradigms selected for coding: Postpositivism (Positivism), Pragmatism, Constructivism (and variants), and Critical Theory (transformative-emancipatory), represent a collapsed (and therefore simplified) classification based on numerous paradigmatic typologies developed by various authors.

Guba and Lincoln (1988) first recognized only two basic paradigmatic stances: the scientific (positivism) and the naturalistic (constructivism) but admitted that these two broad

categories encompassed various subgroups of paradigms. This dichotomous classification seemed too broad for the purpose of this study. Guba and Lincoln (2005) later explicitly defined five paradigm positions: positivism, postpositivism, critical theory, constructivism, and participatory. In the present code sheet positivism and postpositivism were collapsed for simplicity, and participatory is subsumed in the Critical Theory classification. Patton (1988) pointed out that Lincoln and Guba (1988) should have also included pragmatism as the paradigm guiding studies that utilized elements of both (broadly defined) scientific and naturalistic paradigmatically determined methods, supporting the addition of pragmatism in the current code sheet.

Creswell and Miller (1997) used four distinctive paradigmatic research positions and call them positivist, interpretive (equivalent to constructivist), ideological (equivalent to critical theory) and pragmatic. Creswell (2003) later defines the four paradigmatic bases for methodology much as in the code sheet. He calls them postpositivism, constructivism, pragmatism, and advocacy/participatory.

Ponterotto (2005) gave the paradigmatic groups as positivism, postpositivism, constructivism and critical-ideological. Ponterotto points out that positivism and postpositivism share much in common, and lends weight to the decision to collapse them for coding purposes. Ponterotto does not include pragmatism, but his article is focused on qualitative methods and their underlying paradigms and he only mentions positivism to show it as the quantitative contrast to qualitative paradigms.

Teddlie and Tashakkori (in press) give five paradigmatic contrasts: positivism, postpositivism, pragmatism, transformative/emancipatory, and constructivism. The only difference in this classification from the coding sheet is that, again, positivism and

postpositivism are collapsed into one, and transformative/emancipatory assumed in the Critical Theory category.

Particular research paradigms have been connected with methodologies broadly defined as quantitative, qualitative, or mixed (Creswell, 1998; Guba & Lincoln, 1988, 2005; Patton, 1988; Ponterotto, 2005; Teddlie & Tashakkori, in press). Positivism is associated with quantitative studies, and constructivism with qualitative studies; pragmatism and critical theory may be used in purely quantitative or purely qualitative studies, or in mixed methods studies (Teddlie & Tashakkori, in press). For purposes of coding, positivism therefore normally indicates a quantitative study; constructivism is usually indicative of a qualitative one. Pragmatism and critical theory designate quantitative, qualitative, or mixed studies based on other coded characteristics.

Philosophical Contrasts

The different research paradigms can be contrasted on various philosophical foundational elements, most basically: epistemology, ontology, and axiology (Guba & Lincoln, 2005; Ponterotto, 2005; Teddlie & Tashakkori, in press). To these three, logic is added because it also represents a fundamental contrast between the paradigms (Teddlie & Tashakkori, in press), which should be easily identifiable in research articles (see Table 2.2 for a contrast of these philosophical elements across methodologies). Epistemology has to do with the relationship of the knower to the known (i.e., whether they are distinct and independent, or are the same and inseparable). On the one hand an attempt is made to ascertain the truth by objective methods; on the other hand subjective influences in truth seeking are admitted, and even desirable. Ontology concerns the nature of reality; the distinction between paradigms has to do with whether or not the truth about reality is single and unique or multiple and varied. Axiology is about the role of researcher values in the research process: are research methods value free or value bound? Logic

deals with the reasoning process, and in research methodology it can be deductive, inductive, or a mixture of the two (Ponterotto, 2005; Teddlie & Tashakkori, in press).

Postpositivism / Positivism

Positivism is a form of philosophical realism that adheres closely to the hypothetico-deductive method, which is in turn closely associated with the classical scientific method. The scientific method is characterized by the of systematic observation of phenomena contextualized within a theory, the presentation of hypotheses, the use of a controlled experimental study, the use inferential statistics to test hypotheses, and the interpretation of the statistical results in light of the original theory (Ponterotto, 2005, p. 128). Whether is goes by the name of the positivist approach, the scientific method, or the hypothetico-deductive method, positivism is associated with quantitative approaches to research (Creswell, 2003; Creswell & Miller, 1997).

Positivism follows the realist philosophy that there is a dualism between the knower and the known: they are separate and knowledge is something external to the researcher (Creswell, 2003; Creswell & Miller, 1997; Teddlie & Tashakkori, in press). Therefore, positivist epistemology values objectivity (Guba & Lincoln, 2005). The realist philosophy of positivism also sees the truth as a single objective reality, and so its ontology is classified as realism (Creswell & Miller, 1997; Guba & Lincoln, 2005; Teddlie & Tashakkori, in press). Because positivists consider knowledge objective and external to the researcher, there is a concerted effort to make sure individual biases do not influence research outcomes (Creswell & Miller, 1997). This attitude reflects the value free axiology of positivist research methods. Finally, with the almost exclusive use of the hypothetico-deductive model, positivist methodology uses deductive logic.

Postpositivism is a philosophical stance which arose out of discontent with some of the more extreme positions of positivism (Creswell & Miller, 1997). The distinctions separating

positivist from postpositivist philosophies, such as between naïve realism and critical realism, or dualism and modified dualism (Guba & Lincoln, 2005; Teddlie & Tashakkori, in press), are beyond the scope and intent of this study. For this reason, positivist and postpositivist founded research methodologies are collapsed into simply "postpositivist" on the code sheet. For the purpose of broadly defining a paradigm which is indicative of a type of research methodology (quantitative, qualitative, or mixed), one code is sufficient since positivist and postpositivist methodologies are quite similar and both "serve as the primary foundations and anchor for quantitative research" (Ponterotto, 2005, p. 129).

Constructivism (and its variants)

Constructivism (also know as interpretivism or social constructivism) is a paradigmatic alternative to positivism. In contrast to positivist realism, constructivism is ontologically relativist: there are multiple, apprehendable, equally valid realities (Guba & Lincoln, 2005; Ponterotto, 2005; Teddlie & Tashakkori, in press). Epistemologically, constructivism is transactional; meaning is brought to light in a dialogue between the researcher and the participants (Ponterotto, 2005), and is therefore subjective (Guba & Lincoln, 2005; Teddlie & Tashakkori, in press). Constructivism holds that reality is created in the mind of the individual (Ponterotto, 2005), and so the researcher necessarily writes a study that reflects personal views of the phenomenon being studied (Creswell & Miller, 1997). The personal reflection of the researcher in evaluating the phenomenon studied indicates the value-bound axiology of constructivism (Creswell, 2003; Creswell & Miller, 1997; Ponterotto, 2005; Teddlie & Tashakkori, in press); the values of the researcher are of interpretive import to the findings. Constructivism is associated with qualitative methodology (Creswell, 2003; Creswell & Miller, 1997; Ponterotto, 2005; Teddlie & Tashakkori, in press), e.g. the methods utilized in qualitative designs such as biographical, phenomenological, ethnographical, grounded theory, and case

study (Creswell & Marshall, 1997). These qualitative methodologies reason with the use of inductive logic (Teddlie & Tashakkori, in press); meaning is worked out inductively from individual knowledge and contexts (Creswell & Marshall, 1997).

Pragmatism

Pragmatism is "a deconstructivist paradigm that debunks concepts such as 'truth' and 'reality' and focuses instead on 'what works' as the truth regarding research questions under investigation" (Tashakkori & Teddlie, 2003, p. 713). Instead of methods being important, the problem is considered most important by pragmatists, and the researcher uses all approaches to understand the problem (Creswell, 2003, p. 11). As such, pragmatist ontology takes a view of reality in which the research chooses the best point of view to explain the phenomenon; the choice of one ontological view over another simply indicates it is best for explaining the phenomenon. Pragmatist epistemology is seen as existing on a continuum rather than on opposing poles: both subjectivist and objectivist points of view are held. At some points during the research process, the researcher and the participants may require a highly subjective relationship in order to answer complex research questions. At other points, the researcher may more objectively seek distance from participants (Teddlie & Tashakkori, in press). Regarding axiology, pragmatists believe that values play a large role in conducting research and in drawing conclusions from their studies, but they see no reason to be particularly concerned about that influence (Teddlie & Tashakkori, in press). Pragmatist methodology utilizes both quantitative and qualitative methods in designs that have been described above as mixed methods (Creswell, 2003; Creswell & Miller, 1997; Teddlie & Tashakkori, in press). As such, the logic of pragmatist methodology mixes both inductive and hypothetico-deductive approaches (Teddlie & Tashakkori, in press).

Critical Theory (transformative-emancipatory)

"Critical Theory" on the code sheet is used to describe a research paradigm that variously goes by several names (Creswell, 2003; Guba & Lincoln, 2005; Mertens, 2003) including "critical theory" (Guba & Lincoln, 2005), "advocacy/participatory" (Creswell, 2003), "ideological" (Creswell & Miller, 1997), and "transformative-emancipatory" (Mertens, 2003; Teddlie & Tashakkori, in press). This paradigm is characterized as placing central importance on the lives and experiences of marginalized groups such as women, ethnic/racial minorities, members of gay and lesbian communities, people with disabilities, and those who are poor. The researcher who works within this paradigm consciously analyzes asymmetric power relationships, seeks ways to link the results of social inquiry both to action and to wider questions of social inequity and social justice (Mertens, 2003, pp. 139-140).

Critical theory research seeks to disrupt and challenge the status quo; it is a paradigm of emancipation and transformation (Ponterotto, 2005). The epistemology of critical theory research values objectivity in order to provide balanced and complete views of processes and effects. But it is also subjectivist in the transaction between the researcher and the participants to understand various points of view in the construction of knowledge (Guba & Lincoln, 2005; Mertens, 2003; Teddlie & Tashakkori, in press). Further, a dialectic of researcher-participant interaction aims to empower participants to work towards change and transformation (Ponterotto, 2005). Ontologically the critical theory paradigm advocates that reality is constructed within a socio-historical context (Ponterotto, 2005), a kind of historical realism that sees a virtual reality shaped by social, political, cultural, economic, ethnic, and gender values (Guba & Lincoln, 2005). The ontology of critical theory holds that diverse viewpoints help us to understand social reality and provide the basis for promoting justice (Mertens, 2003; Teddlie & Tashakkori, in press). In terms of axiology, critical theory sees the values of social justice guiding all aspects of

research (Teddlie & Tashakkori, in press). The researcher's proactive values are also seen as vital to the central transformative purpose and task of this research (Ponterotto, 2005). In terms of its logic, critical theory may utilize either/or hypothetico-deductive or inductive methods (Teddlie & Tashakkori, in press). Critical theory is most often associated with qualitative methods (Creswell, 2003), but may also be the underlying paradigm for mixed methodological studies as well (Mertens, 2003; Teddlie & Tashakkori, in press).

Sampling Methods

Sampling in quantitative methods can be simply defined as procedures of "selecting a small number of units from a population to enable researchers to make reliable inferences about the nature of that population" (Krathwohl, 1998, p. 160). More generally in "sampling" the researcher selects "units (e.g., events, people, groups, settings, artifacts) in a manner that maximizes the researcher's ability to answer research questions that are set forth in a study" (Tashakkori & Teddlie, 2003, p. 715). Sampling techniques are usually broadly distinguished in two separate groups: probability and non-probability sampling (Creswell, 2002; Krathwohl, 1998). Non-probability techniques are also referred to as purposeful sampling methods, particularly when referring to qualitative sampling techniques (Creswell, 1998, 2002; Kemper, Stringfield, & Teddlie, 2003; Patton, 2002). Purely quantitative studies typically use probability sampling, while qualitative studies most often use purposeful sampling strategies (Patton, 2002), though neither technique is the sole domain of either research tradition (Creswell, 2002; Kemper, Stringfield, & Teddlie, 2003). In fact, mixed methods studies often use a blend of probability and purposeful sampling techniques, following the strategy of doing whatever it takes to answer the research question (Kemper, Stringfield, & Teddlie, 2003).

According to Patton (2002) convenience sampling (samples consisting of volunteers or a captive audience) is a type of purposeful sampling, used to study an easily accessible group

which the research deems representative of the population in question. As a purposeful sampling method, convenience sampling would typically be used in studies with qualitative methods (Patton, 2002). However, the pilot study conducted in preparation for the study showed that convenience sampling was used frequently in otherwise wholly quantitative studies. This was confirmed by S. R. Hutchinson (personal communication, May 9, 2006) who indicated that she encountered the same prevalence of convenience sampling in both quantitative and qualitative methodologies in a similar study of research articles (Hutchinson & Lovell, 2004). Teddlie and Yu (2007) have developed a formal taxonomy of sampling methods which adds convenience sampling as method independent of probability, purposive, or mixed methods sampling; this taxonomy is adopted in the study.

For the purpose of coding, sampling methods were recorded as probability, purposeful, mixed techniques, or convenience. In general, probability sampling was considered evidence of a quantitative or mixed study, while purposeful sampling was taken as most likely coming from a qualitative or mixed study. Mixed techniques could be indicative of quantitative, qualitative, mixed studies, but are considered to be most common in mixed methods designs. Convenience sampling was considered as a possible element of quantitative, qualitative, or mixed methods studies.

Further, the particular type of technique was also recorded. Probability sampling often has as its goal generalizability, or the ability to extrapolate findings from a subset of a population to a larger population (Kemper, Stringfield, & Teddlie, 2003, p. 277), most often through the application of inferential statistics (Krathwohl, 1998). Probability sampling most frequently uses one of four common techniques: simple random sampling (a truly random selection), systematic random sampling (every n^{th} unit), stratified random samples (where the population is divided into groups and random choices made from the groups), and cluster random sampling (where the

unit is a group and not individual) (Kemper, Stringfield, & Teddlie, 2003). These types were recorded as defined and described in various standard texts (Creswell, 1998, 2002; Johnson & Christensen, 2004; Krathwohl, 1998).

Purposeful sampling, as the name implies, means selecting specific units based on a specific purpose rather than randomly (Tashakkori & Teddlie, 2003). Researchers intentionally select participants or events to learn or understand the central phenomenon being studied (Creswell, 2002). There are numerous purposeful techniques including extreme, typical, and critical case sampling, convenience sampling, homogeneous or variation sampling, confirming or disconfirming sampling, opportunistic sampling, and others. Purposeful sampling types were coded according to the definitions and descriptions of these methods in various standard texts (Creswell, 1998, 2002; Kemper, Stringfield, & Teddlie, 2003; Patton, 2002).

Convenience sampling draws on samples fitting the study criteria that are both easily accessible and willing to participate in a study; these are usually either captive or volunteer samples (Patton, 2002; Teddlie & Tashakkori, in press; Teddlie & Yu, 2007). For this study the use of non-probability sub-samples of secondary data from larger surveys or samples was also considered convenience sampling.

If a study uses sampling techniques in the form of a combination of probability, purposeful, or convenience methods, it was coded as mixed techniques. However, the use of multiple techniques, if exclusively random or purposeful, was coded as one of those two.

Data Collection Methods

Among the numerous data collection techniques, five broad categories (tests, questionnaires, interviews, observation, and secondary data) common to various texts (Creswell, 2002; Johnson & Christensen, 2004; Johnson & Turner, 2003; Teddlie & Tashakkori, in press) were chosen for coding purposes. Tests or experimental measures are those methods which

collect data through the use of an instrument designed to test the outcomes of an experimental treatment, e.g. a standardized test (Creswell, 2002; Johnson & Christensen, 2004). As such, tests/experimental measures are almost always associated with quantitative methods, unless they are one part of a multi strand mixed method design (Teddlie & Tashakkori, in press).

Data collection methods which are variously termed "survey" (Creswell, 2002) or "questionnaire" (Johnson & Christensen, 2004; Johnson & Turner, 2003; Teddlie & Tashakkori, in press) are collapsed into the code sheet category of questionnaire. These data collection techniques involve the use of an instrument that is completed by each participant and are generally used to obtain the thoughts, feelings, attitudes, or beliefs of the research participants (Creswell, 2002; Johnson & Christensen, 2004). A questionnaire may be quantitative, qualitative, or mixed depending on the open-ended or closed-ended nature of the questions asked. A quantitative questionnaire utilizes completely structured and closed-ended questions: all participants fill out the same questionnaire, and all of the questions or items provide all possible responses from which the participant must select. A qualitative questionnaire typically uses open-ended items to be answered by all or a subset of the participants; the participants provide the answers in their own words and in the order they choose. A mixed questionnaire is a mixture of closed and open-ended items which collects both quantitative and qualitative data from the respondents (Johnson & Turner, 2003, pp. 303-304).

The code sheet allows for the indication of open or closed-ended types of questionnaires. Closed-ended questionnaires were regarded as supporting a quantitative study, while open-ended ones were associated with qualitative studies. Questionnaires with both open and closed-ended items were seen as part of mixed methods studies. Studies with multiple data collection strands utilizing both types of questionnaires were also coded as mixed.

Observation, defined as the "unobtrusive watching of behavioral patterns" (Johnson & Christensen, 2004, p 186), is a data collection method which most commonly involves some degree of participation by the researcher (e.g. as a participant observer (Spradley, 1980)), and the taking of field notes (Creswell, 1998, 2002; Johnson & Christensen, 2004). For this reason, observation is a data collection method most often associated with qualitative studies. Teddlie and Tashakkori (in press) use the term "unobtrusive measures" in a more comprehensive manner to indicated observation which is covert and passive, as well as the study of artifacts. For purposes of the study, covert or "unobtrusive" observation (Teddlie & Tashakkori, in press) as well as full participant observation, in which the researcher/observer is a known and/or a full participant in the phenomenon (Spradley, 1980), was simply coded as "observation." The study of artifacts (e.g., archival records) was coded as "secondary data" and is considered further below.

It is important to note that observation can be unstructured, with little or no standardization of procedures and the production of primarily narrative data; or it may be structured, with the standardization of all observational procedures in order to obtain quantitative data such as counts or frequencies, or percentages (Johnson & Christensen, 2004). For coding, observation techniques which are not structured were considered part of qualitative research. If structured, they were coded as such, and considered in support of quantitative studies. Of course, both types of observation may also be part of a mixed method design.

Interviews, when the researcher directly asks questions to the participant, like observation, may be either quantitative or qualitative. Quantitative interviews (e.g. polls) are those with a standardized interview protocol, offering all participants the same questions and the same set of possible closed-ended responses (Johnson & Christensen, 2004). For this reason the

sub code of "standardized-closed" is included on the code sheet to indicate a quantitative study interview.

More commonly, interviews are part of qualitative studies (Creswell 2002; Teddlie & Tashakkori, in press) and are open-ended. Interviews exist along a continuum from informal conversational interviews, to guided interviews, to standardized open-ended interviewing (Patton, 2002). And, once again, interviews may also be part of a mixed methods design (Teddlie & Tashakkori, in press).

Focus groups are a kind of "group interview" (Johnson & Christensen, 2004, p. 185) or "interactive interview" (Tashakkori & Teddlie, 2003, p. 708), which include a small group of persons led in the interview protocol by a group moderator. As such, they were coded as interviews when this type of data collection is encountered in research articles. Further, since focus group interview questions utilized an open-ended format by definition (Johnson & Christensen, 2004; Tashakkori & Teddlie, 2003) they were considered a qualitative data collection method.

Secondary data is a broad category used to cover the analysis of data originally collected at an earlier time, document analysis, or artifact analysis. It falls under the broader category of unobtrusive measures (Teddlie & Tashakkori, in press) mentioned earlier, but for the purpose of coding, the narrower senses mentioned above was utilized. Secondary data can be any type of quantitative or qualitative data collected at an earlier time for another purpose which is looked at for new analysis. It may also be the examination of personal or official documents (e.g. census data), or any other physical data (Johnson & Christensen, 2004; Johnson & Turner, 2003). Secondary data may be in its original form quantitative, qualitative, or mixed, and it may be subsequently subjected to quantitative or qualitative types of data analysis. Therefore secondary

data collection, depending on its utilization in a research study, may indicate either a quantitative, qualitative, or mixed research study.

Other data collection methods were recorded in the category "other" on the code sheet, and the type of method described if it was a well-known technique such as focus groups.

Data Types

All data exist in either a numeric or a narrative form. Numeric data is typically indicative of quantitative studies; narrative data is normally part of qualitative studies (Teddlie & Tashakkori, in press). Mixed methods studies may utilize either numeric or narrative data, or both. Additionally, mixed methods studies may involve qualitizing, i.e., collecting data of a quantitative type and converting it into narratives that can be analyzed qualitatively. Or, qualitative data types may be converted into numerical codes that can be statistically analyzed in a process called quantitizing (Tashakkori & Teddlie, 2003, p. 706). Such "data conversion" it indicative of a mixed method study and was described earlier as being part of the mixed method conversion design (Teddlie & Tashakkori, in press).

Data Analysis

Data analysis techniques fall into one of two broad categories defined as either quantitative or qualitative (Creswell, 2002; Johnson & Christensen, 2004; Onwuegbuzie & Teddlie, 2002). Mixed methods data analysis is a kind of hybrid of the two, which can be defined as "the use of quantitative and qualitative analytical techniques, either concurrently or sequentially, at some stage beginning with the data collection process, from which interpretations are made" (Onwuegbuzie & Teddlie, 2003, pp. 352-353). Articles were coded in one of these three categories, each supporting a research type. The specific type of quantitative, qualitative or mixed data analysis was also indicated.

Quantitative data analysis takes some form of statistical analysis, either descriptive or inferential or both (Creswell, 2002; Johnson & Christensen, 2004). Descriptive statistics focus on describing, summarizing, or explaining numeric data (Johnson & Christensen, 2004). Descriptive statistics can take various forms including frequency distributions, graphic presentations of data, measures of central tendency (mean, median, mode), measures of variability (variance, standard deviation, range), and measures of relative standing (z-scores, percentile ranks) (Creswell, 2002; Johnson & Christensen, 2004). Quantitative studies often make use of both descriptive and inferential statistics, and the type was only described as descriptive if descriptive statistics alone are utilized (Hutchinson & Lovell, 2004). Inferential statistics go beyond the immediate data and infer the characteristics of a population based on a sample or samples from it (Johnson & Christensen, 2004). Inferential statistics involve hypothesis testing and can take on many forms depending on the nature of the variables (continuous or categorical), the number of variables (univariate and multivariate) and the nature of the distribution of the population (normal or non-normal) (Creswell, 2002). The various inferential statistical test types were indicated according to the definitions provided in standard texts (e.g., correlation analysis, regression analysis, analysis of variance, discriminant analysis, etc.) (Creswell, 2002; Johnson & Christensen, 2004; Krathwohl, 1998). A rather comprehensive list of statistical techniques for reference was the list utilized in the code sheet developed by Hutchinson & Lovell (2004).

Qualitative data analysis is essentially the development of a typology of categories or themes that summarize, describe, and explain a mass of narrative data. The narrative data are usually prepared for analysis by converting raw data (field notes, etc.) into processed data (e.g., transcripts) which are then coded (in one of several coding processes, e.g., open, axial, and selective coding) and subjected to some analysis scheme. Qualitative data analysis schemes can

be divided into two groups based on whether the themes and categories were established a priori, or emerged from the analysis. A priori schemes include procedures like simple valence analysis and manifest content analysis. Emerging schemes are those like latent content analysis, the constant comparative method, and the developmental research sequence (Tashakkori & Teddlie, 1998, pp. 117-119). The various qualitative data analysis types were indicated on the code sheet based on the above and other descriptions of qualitative analysis as described in standard texts (Creswell, 1998, 2002; Johnson & Christensen, 2004; Krathwohl, 1998; Tashakkori & Teddlie, 1998).

The broad categories of data analysis described above are not meant to be comprehensive. Denzin and Lincoln (2005a) in their *Handbook of Qualitative Research* gave place to an ever expanding array of qualitative research methodologies and forms of qualitative analysis (e.g., performance ethnography, art-based inquiry, poetics, and writing as a method of inquiry). Ryan and Bernard (2000) helped to contextualize the broad diversity in qualitative data analysis, with their distinction between two basic traditions in narrative data analysis:

> the *linguistic tradition*, which treats text as an object of analysis itself, and the *sociological tradition*, which treats text as a window into the human experience … The linguistic tradition includes narrative analysis, conversation (or discourse) analysis, performance analysis, and formal linguistic analysis… There are two kinds of written texts in the sociological tradition: (a) words or phrases generated by techniques for systematic elicitation and (b) free-flowing texts, such as narratives, discourse, and responses to open-ended interview questions. (p. 769)

The linguistic tradition of qualitative analysis is more commonly found in the arts and humanities, while the sociological tradition applies more to the behavioral and social sciences, the area studied here (Teddlie & Tashakkori, in press). Thus the description of qualitative data analysis for the purpose of coding articles in this study is of a more limited scope.

The Coding Process for Determining Type of Article

It should be noted that the coding process is not necessarily linear. It was pointed out earlier that the final coding of an article as quantitative, qualitative, or mixed methodologically would come after coding all the other categories. Furthermore, of the six basic categories used to describe quantitative, qualitative, or mixed methodological studies (research design, paradigm, sampling, data collection, data type, and data analysis methods) some were evident in analyzing the article before others. For example, some articles were correctly coded quantitative research designs because the methodology section spells it out from the start. In other cases, the methodology section may not be so explicit, and the research design could only be surmised after coding the supporting categories of sampling, data collection, and data analysis types. For example, an article might only be coded as a quantitative research design after reading a description of the probability sampling and inferential statistical procedures utilized. In most cases, the research paradigm was not explicitly stated, and was only coded after all the other elements.

In all cases, the ultimate coding of a research article as quantitative, qualitative, or mixed depended on all the coded elements being applicable as spelled out in the operational definitions. It is important to note that, following the procedure developed by Niglas (2004), when all of the elements could not be established as supporting a quantitative or qualitative study, it was classified as a mixed methodological study. This was the case even if the author of the article did not have an explicit intention of designing and conduction a mixed methods research study. The rationale for coding research studies as mixed methodologically in such cases is that the quantitative-qualitative division of research methods is a kind of false dichotomy. Teddlie and Tashakkori (in press) hold that there is really a continuum of research methodologies with quantitative methods and qualitative methods simply being the endpoints. In this view research

studies may be anywhere on the continuum, but such a condition is not amenable to the coding required for this study. Therefore, for the sake of clarity and analysis, the position of Niglas (2004) is adopted for this study that any article that did not strictly fall into all the quantitative or qualitative codes was coded as a mixed methodological study. It may occur, therefore, that an article that has an explicitly quantitative or qualitative design was coded as a mixed methodological study because in making its inferences it uses a blend of methods which are clearly both quantitative and qualitative. For example a study which describes itself as a survey design and employs inferential statistical data analysis may also include qualitative data from interviews in drawing its final conclusions. In such a case, though self-described as a quantitative design, the article is in fact mixed methodologically.

Pilot Study

In preparation for the study, a small pilot study was undertaken. This pilot study used the code sheet (see Appendix) developed from the operational definitions to code research articles in the four selected disciplines: psychology, sociology, education, and nursing.

Sampling did not follow the methods outlined above in the section on sampling methods. Rather, for convenience, journals from each of the four disciplines were selected based on an informal survey which showed them to be publishing predominately empirical research in the field. To keep the size of the pilot study manageable, only one journal from each discipline was chosen. The journals thus selected were *Current Psychology, Sociological Inquiry, American Educational Research Journal,* and *Journal of Advanced Nursing.* As it happens, two of the journals, *American Educational Research Journal* and *Journal of Advanced Nursing,* do fall in the top five based on the multiple factor of Total Citations and Impact Factor as described above in the section on journal selection.

Twenty-one articles from each journal were coded, and this process revealed the code sheet to be an effective means of qualitatively analyzing research articles. Of the 84 articles coded, 73 were original empirical research. The raw qualitative data was quantitized in a frequency table and differences between the disciplines, and in particular between the soft/life/pure and soft/life/applied groups were noted. Statistical analysis utilizing Chi-Square did not find these differences to be significant. However, based on the small convenience sample, these findings were not considered conclusive.

Data Analysis Methods

The initial form of data analysis was manifest content analysis on the research articles utilizing the code sheet instrument. Based on the operational definitions, the content of each article was analyzed to categorize its elements on the code sheet.

The code sheet results were then put in tabular form as descriptive statistics showing the number and frequency of each category for each of the disciplines. For purposes of analysis, the totals for each two disciplines in the two Biglan (1973a, 1973b) groupings under consideration were compiled in a similar fashion. The results were contingency tables showing quantitized data representing the disciplinary groupings in terms of the various categories.

The quantitized data were analyzed with the Chi-Square test for independence. The Chi-Square test is a popular nonparametric statistical test for analyzing nominal variables (categorical data) (Aron, Aron, & Coups, 2006). Chi-Square is used often in the behavioral and social sciences (Johnson & Christensen, 2004), and quite appropriate for analyzing the journal article data. Nonparametric tests like Chi-Square can produce meaningful results even when all usual assumptions of statistical inference are not met (Aron, Aron, & Coups, 2006), for example normality and homogeneity of variance. Chi-Square is therefore a useful test for the comparison of the two primary categorical variables in the study: the disciplinary groupings of disciplines as

soft/life/pure and soft/life/applied. Further, all other variables used to compare these two groups are also categorical, for example the classification of methodology as quantitative, qualitative, or mixed.

The Inference Process and Issues of Trustworthiness

The inference process of the study proceeded in two stages. In the first instance, inferences of a qualitative nature were made based on the content analysis and coding of the research journal articles. Basically, these articles were designated quantitative, qualitative, or mixed methodologically. The major issue in this case is the credibility (Lincoln & Guba, 1985) of findings based on the data collection method. The only source of data for the study was research journal articles; however, to boost the credibility of these data two disciplines from each Biglan (1973a, 1973b) group studied were selected, as well as five journals from each of those disciplines, and thirty articles from each of those journals. Even though this process is not strictly speaking data triangulation, it does increase the breadth and depth of the data and promote the truth-value of findings designating articles as belonging to a particular methodology.

Another challenge to credibility is the fact that a single researcher analyzed the articles. Hutchinson and Lovell (2004) overcame this threat to credibility with investigator triangulation (Patton, 1990), having both researchers code articles and compare results. Niglas (2004) also dealt with issue of the reliability of coding by a single researcher by conducting a reliability study in which a small group of articles was selected and subjected to coding by group of Ph.D. students familiar with research methodology who volunteered to do the encoding, and Niglas then gauged inter-rater reliability among them.

For the present study an independent coder (a Ph.D. student well versed in methodology) was utilized to code a small sample of research articles already coded by the researcher. The two sets of coding were then compared and a degree of correlation established using Cohen's Kappa

statistic for inter-rater reliability involving two independent raters. Cohen's Kappa statistics were calculated for the coded data relevant to the three research questions. Following the generally accepted rates of .70 and higher being acceptable correlation and .80 and higher being good for Cohen's Kappa, the results showed good inter-rater reliability. Relative to the first research question regarding preferred methodologies across the Biglan groups, the article type coding was highly correlated between the raters (Cohen's Kappa = .893). Regarding the third research question concerning underlying paradigms of the various methodologies, the paradigm type correlation across the two raters was also good (Cohen's Kappa = .802). For research question two about the connection between methodological components and the disciplinary groups, the correlation in three coded areas was calculated. For research design the correlation was good (Cohen's Kappa = .801), acceptable for sampling methods (Cohen's Kappa = .753), and very high for data collection methods (Cohen's Kappa = .834).

Niglas (2004) also selected a small group of already coded articles, which she re-coded a second time after a lapse of six months. In this fashion Niglas insured the stability of her own coding practice. This technique was also utilized by the researcher in this study to insure the credibility inferences about the research methodology of the journal articles.

The consistency and dependability of the article analysis was also enhanced through the use of the inquiry audit technique (Lincoln & Guba, 1985). Niglas (2004) followed this method, also to be used in the study, of providing exact operational definitions of the methods indicators coded. The entire process, decision points, and operational definitions are spelled out in great detail in the above sections of this proposal. In this way the neutrality and lack of bias of the research was indicated, assuring the conformability of results.

Finally, this first stage of inference could claim inference transferability (Lincoln & Guba, 1985) based on the purposeful sampling technique involved. Inference transferability in

the study was insured by the selection of a representative sample form each of the disciplines. The selection of two disciplines from each group is meant to give this representation. Such a selection addresses the issue of population transferability, with the samples drawn so that inferences can properly be extended to other disciplines in those groupings. In this way, what is found to be the methodology of psychology and sociology, for example, could be inferred to the entire soft/life/pure group.

The second stage of the inference process in the study dealt with the statistical inferences drawn from the Chi-Square test of independence between the various disciplinary groups. Issues of internal and external validity, as well as reliability of this test are identical to the issues of credibility, dependability, and transferability discussed above, since the test was performed on a single set of data collected through the article analysis.

A major potential threat to any statistical inference, and a significant consideration in the study, is lack of adherence to assumptions. In the case of the study the assumption of randomness is only partially met. The disciplines studied are purposively, not randomly, chosen to represent the Biglan (1973a, 1973b) groups for the reasons indicated in the discussion above concerning sampling. Furthermore, the journals from which the articles were sampled were also purposively chosen to represent typical research methods utilized in a discipline, also through the method already described. Those factors notwithstanding, however, the research articles themselves were systematically randomly sampled from the journals purposively chosen to represent the disciplines.

To the extent that the same researcher does not author multiple articles, the assumption of independence of samples was met. For the most part each article in each journal was an independent research study by unique researchers utilizing methods particular to that unique project.

Given these factors, meaningful statistical inferences were drawn from the Chi-Square analysis. As such conclusions could credibly be drawn from the analysis concerning the relationship of disciplinary groupings in the Biglan (1973a, 1973b) classification scheme and preferred research methodologies, the use of particular methodological components, and relationships between disciplinary groupings and/or preferred methodologies and the underlying research paradigms.

CHAPTER 4: FINDINGS

Overview

After selecting journals and sampling articles, data analysis was performed with the three research questions in view. The fundamental research question concerns the validity of the Biglan groupings based upon preferred research methods. To answer this question the coded Article Types were analyzed for within and between group differences.

Finding significant differences in preferred methodologies between the disciplinary groups, the second research question anticipated finding these differences within the various methodological components making up Quantitative, Qualitative, and Mixed Methods*. Data analysis in this area focused on Research Design, Sampling Methods, and Data Collection Methods. Significant differences were found in various components, including Research Design in the Quantitative area, Sampling Methods, and Data Collection Methods.

Finally, it was expected that the Paradigms underlying the three basic research methodologies would also be significantly different. Analyzing the Paradigm codes did show significant differences in this area as well.

In all cases the statistical method used to compare the categorical data was Chi Square analysis. Standardized residuals were used to follow up the analysis and demonstrate the strongest contributors in each case to the significant differences. The Cramer's V statistic was also used in some cases to show the strength of association between the variables.

Disciplinary Journal Composition

In order to randomly sample research articles from each of the twenty journals selected, the composition of the journal articles had to be analyzed. Research articles were distinguished

* Henceforth in this document terms such as Quantitative, Qualitative, Research Design, Paradigm, etc. are capitalized in reference to the categories of data collected on the code sheet (see Appendix) and presented in the tables of this chapter.

from six other types of journal articles as described above (pp. 84-86). The article type composition of each disciplinary journal showed variation within the disciplines and between them. The breakdown of article types by discipline is shown in Table 4.1.

Table 4.1

Percentage Composition by Journal Article Type

Research	Expository	Expository w Data	Opinion/Theory	Historical	Review	Informational
Psychology						
87.02	1.93	4.50	3.86	0.00	0.00	2.70
Sociology						
37.49	2.87	2.27	3.17	1.19	50.74	2.27
Pure						
59.03	**2.46**	**3.24**	**3.47**	**0.67**	**26.68**	**2.46**
Nursing						
54.49	8.80	5.96	13.91	0.09	5.96	10.97
Education						
54.56	3.11	4.66	16.50	0.78	4.66	15.73
Applied						
54.42	**6.93**	**5.53**	**14.76**	**0.32**	**5.53**	**12.40**

The journals' makeup illustrates various distinctions of note. First is that, on average, all the journals in all disciplines published between 50 and 60 percent research articles. This descriptive indicates that even for journals categorized as research oriented, almost half of the articles published were not empirical research studies. Further, there was more congruency in terms of the percentage of empirical research studies published in each of the disciplines in the

Applied group (Education and Nursing each about 54%) than there was in the Pure group (Psychology with about twice as many research articles on average per journal than Sociology).

A second distinction is in the number of book reviews published by the different journals. In particular, over half of the Sociology articles published were book reviews. This high percentage stands out not only in contrast to the average of the Applied group (5.53%) but is also exceptional when compared to Psychology, the other discipline in the Pure group which had zero book reviews in the journals sampled. On the other hand, both Nursing and Education published book reviews in line with the group average of 5.53%. These findings indicate more variance between the two disciplines in the Pure group than between the two in the Applied group, at least in the preference for writing and publishing book reviews.

Finally, it is noted that Opinion/Theory type articles were published in the Applied disciplines at a rate of about five times greater than was done in the Pure discipline journals. Expository type articles were published about twice as much in the Applied journals than in the Pure ones, and Informational articles were published about six times more often in the Applied journals than the Pure ones.

Preferred Research Methodologies

The first research question asks if there are significant differences between the Pure and Applied disciplinary groups. Utilizing a single 2 X 3 contingency table (the two disciplinary groupings and three categories of methodology), the disciplinary groups were compared in terms of frequency of chosen methodologies (Quantitative, Qualitative, or Mixed Methods) to see if there were significant differences between them. The null hypothesis was that there is no relationship between disciplinary grouping and the frequency of a specific type of methodology. The frequencies of each type of method in each of the disciplines individually and combined as groups is shown in Table 4.2.

Table 4.2

Preferred Methodologies by Discipline and Group

	Quantitative	Mixed Methods	Qualitative
Psychology	140	10	0
Sociology	116	7	27
Pure Total	**256**	**17**	**27**
Nursing	98	13	39
Education	63	36	51
Applied Total	**161**	**49**	**90**

The results of the Chi Square analysis revealed there were significant differences in preferred methodologies between the Pure and Applied disciplinary groups (Chi Square = 70.08, $p < .001$). The measure of association between the variables indicates that the relationship between the groups and preferred methodologies is not only significant but relatively strong (Cramer's V = .344).

Further, the standardized residuals of each cell in the contingency table show that the significant difference is contributed to by the individual differences between groups in each of the three methodologies. Table 4.3 gives the standardized residuals. In each case, Quantitative, Qualitative and Mixed Methods, the standardized residuals are all greater than $\left|2\right|$, indicating that each area contributes to group differences. The greatest difference is between Pure and Applied use of Qualitative methods, followed by the differing use of Quantitative methods. Mixed Methods contribute the least to the differences, but are still a strong contributor with a standardized residual of 2.8.

Table 4.3

Preferred Methodologies Standardized Residuals

	Quantitative	Mixed Methods	Qualitative
Pure	3.3	-2.8	-4.1
Applied	-3.3	2.8	4.1

In addition to differences between the Pure and Applied groups, Chi Square analysis also revealed significant differences within the groups. Using 2 X 3 contingency tables as in the comparison above, Psychology and Sociology and then Education and Nursing were compared relative to preferred methodologies.

The differences between Psychology and Sociology within the Pure group were statistically significant (Chi Square = 29.78, $p < .001$), but most of this difference is accounted for in the variation in the use of Qualitative methods (Standardized residual = 3.7), where there were zero cases in the sample from Psychology as compared to 27 cases in Sociology (Table 4.2). Standardized residuals indicated the differences in Quantitative and Mixed Methods use in the Pure group did not contribute substantially to the significance. These results correspond to the expectation that high impact journals in Psychology would predominantly follow traditional postpositivist methods, but the result of zero Qualitative methods articles is somewhat surprising in its implication that Postpositivism is still so prevalent in this field.

The differences within the Applied group were also significant (Chi Square = 20.01, $p < .001$), but in this group most of the difference lay in the variation of one preferred methodology, Mixed Methods. There were three times as many Mixed Methods articles from Education as from Nursing (Table 4.2), and this difference had the greatest statistical influence (Standardized

residual = 2.3). The differences in Quantitative and Qualitative methodologies did not contribute substantially to the significant difference between Education and Nursing.

In summary, the findings indicate within group differences that, while significant, do not detract from the overall significant differences between the Pure and Applied groups. Further, the differences between the groups are more comprehensive than those within the groups, since differences in all three preferred methodologies contribute to the statistical significance in the between group comparison. These results support the validation of the Biglan classification scheme for disciplinary differences in regard to the fundamental aspect of preferred research methodologies.

Differences in Methodological Components

Frequencies of different methodological components were compared across the two groups to address the second research question. In terms of the code sheet data, the categories of Data Types and Data Analysis were perfectly congruent with the Article Type, so they served as merely confirmatory data. Therefore, the true contrasting components were Research Design, Sampling Methods, and Data Collection Methods. Several 2 X N contingency tables were constructed comparing the various methodological components across the two disciplinary groups. The null hypothesis in each case was that there is no relationship between disciplinary grouping and a particular methodological component, for example forms of data collection or types of sampling methods. Throughout all the Chi Square analyses, the significance level was set at .05

Research Design Differences

Given the significant differences found between the preferred methodologies, it was expected that the designs common to those methods would also show significant differences since Research Design is the most comprehensive of all the methodological components.

However, Chi Square analysis of differences between Pure and Applied disciplines across all Research Design types did not yield valid results because more than 20% of the cells had expected counts of less than five. Therefore the disciplinary groupings were compared across the separate results of Quantitative, Mixed Methods, and Qualitative Research Designs. Tables 4.4, 4.5, and 4.6 give the frequencies of the various research design types within the three basic methodological types of articles. Since the sample sizes are not equal in these comparisons, the percentage of each design as a part of the total Quantitative, Qualitative, and Mixed Methods designs is given beside each frequency.

Table 4.4

Quantitative Research Design Frequencies and Percentages by Discipline and by Group Total

	Experimental/True		Experimental/Quasi		Causal		Correlational		Survey	
Pure										
Psychology	36	26%	12	9%	30	21%	62	44%	0	0%
Sociology	1	1%	2	1%	31	27%	82	71%	0	0%
Total	**37**	**14%**	**14**	**5%**	**61**	**24%**	**144**	**56%**	**0**	**0%**
Applied										
Nursing	21	22%	6	6%	21	22%	45	46%	5	4%
Education	17	27%	7	11%	10	16%	27	43%	2	3%
Total	**38**	**24%**	**13**	**8%**	**31**	**19%**	**72**	**45%**	**7**	**4%**

Chi Square analysis showed that there were significant differences between the Pure and Applied groups in terms of the preference for Quantitative Research Designs (Chi Square = 20.24, $p < .001$, Cramer's V = .22). Contributing mostly to this significance is the fact that there were no Survey design studies in the sample from the Pure group. A partial explanation for this discrepancy is that Sociology research frequently draws from secondary sources (see Table 4.8)

like census and socioeconomic status data, which in the first instance might have been through a survey. An example is a study of inequality in various countries around the world utilizing secondary data from of various types of data collection instruments (including surveys) from numerous countries around the world (You & Khagram, 2005). In cases such as this one, Sociology articles tend to utilize Correlational designs to analyze secondary data, also giving some meaning to the high percentage of Correlational articles in the Sociology sample.

Chi Square analysis for differences within the Pure and Applied groups across the various Quantitative Research Designs showed significant differences within the Pure group (Chi Square = 41.16, $p < .001$), but not within the Applied Group (Chi Square = 2.71, $p = .608$). Within the Pure group most of the difference is accounted for by the almost total lack of Experimental studies (both True and Quasi) in Sociology relative to their heavy use in Psychology (see Table 4.4). This difference results from the focus in the Sociology journals sampled on macro issues such as social class, gender, or ethnicity which do not lend themselves to experimental methods.

Since the sample sizes are unequal in the above comparison, it is also helpful to compare the percentage use of each Quantitative design to amplify the statistical results. This comparison confirms that the two biggest differences in preferences for Quantitative research designs between the groups are in the lack of Experimental designs in Sociology, and the complete lack of Survey designs in the Pure group.

Mixed Methods designs were not significantly different between the groups at the .05 level of significance (Chi Square = 5.06, $p = .080$). The frequencies of Mixed Methods designs are shown in Table 4.5 (there were no Fully Integrated designs in the entire sample). Notable is that most Mixed Methods designs across both groups are Quasi-Mixed Monomethod designs. In the Applied group, where Mixed Methods articles are more frequent, the distribution of designs

is spread out among Quasi-Mixed, Concurrent, and Sequential designs. In the Pure group most of the Mixed Methods articles utilized the Quasi-Mixed design.

Table 4.5

Mixed Methods Research Design Frequencies

	Quasi-Mixed Mono	Concurrent	Sequential	Conversion	Quasi-Mixed Multi
Pure					
Psychology	7	0	2	0	1
Sociology	3	0	4	0	0
Total	**10**	**0**	**6**	**0**	**1**
Applied					
Nursing	1	4	8	0	0
Education	18	7	10	1	0
Total	**19**	**11**	**18**	**1**	**0**

Within group Chi Square comparisons of Mixed Methods design differences were not possible due to the number of cells low frequencies.

Chi Square analysis of the use of different Qualitative designs was not valid due to the large number of cells with low expected counts. Table 4.6 shows the Qualitative design frequencies. While significant differences cannot be statistically shown, the data in Table 4.6 indicate that most of the Qualitative designs used in the Pure group are Case Studies. And while Case Studies are the most frequently used design in the Applied group, there is a fair distribution of designs in the sample. Further, no Phenomenological designs were found in the pure sample, with twenty found in the Applied sample.

Table 4.6

Qualitative Research Design Frequencies

	Ethnography	Case Study	Narrative	Phenomenological	Grounded Theory	Critical
Pure						
Psychology	0	0	0	0	0	0
Sociology	3	15	1	0	4	4
Total	**3**	**15**	**1**	**0**	**4**	**4**
Applied						
Nursing	1	7	1	19	5	6
Education	3	34	1	1	5	7
Total	**4**	**41**	**2**	**20**	**10**	**13**

There are some interesting contrasts within the groups as well. Most notable is the fact that within the Pure group the Psychology sample yielded no Qualitative designs at all, while Sociology had twenty-three, the vast majority being Case Studies. Within the Applied group two differences stand out. First is the heavy use of Case Studies in Education relative to Nursing. Second, is the disproportionate use of Phenomenological designs in Nursing, where concern with the quality of patient experience lends itself to this type of design. For example, in order to explore the phenomenon of suffering among hospital patients, Bergh, Jakobsson, Sjostrom, & Steen (2005) conducted a Phenomenological design study about pain among older patients following orthopedic surgery.

Sampling Methods Differences

Chi Square analysis of the differences in all four Sampling Methods between the Pure and Applied groups was not valid due to the low cell counts in Mixed Methods sampling. With

Mixed Methods removed from the sample, Chi Square analysis shows significant differences in Sampling methods between the Pure and Applied groups across the other three Sampling categories (Chi Square = 44.65, $p < .001$). The majority of this difference is accounted for by the difference in Purposive sampling (Standardized residual = 4.1). Table 4.7 gives the sampling frequencies by group and by discipline.

Table 4.7

Sampling Methods Frequencies

	Probability	Mixed	Purposive	Convenience
Pure				
Psychology	15	0	2	133
Sociology	39	1	27	83
Total	**54**	**1**	**29**	**216**
Applied				
Nursing	26	2	37	85
Education	10	3	55	82
Total	**36**	**5**	**92**	**167**

Within group comparisons show that Sociology used a great deal more purposive sampling than Psychology, corresponding to the contrast in the use of Qualitative methods between the two disciplines. Surprisingly, Sociology also showed twice as many uses of Probability sampling than Psychology in the articles coded. On the other hand, Nursing and Education are fairly congruent in the types of Sampling methods utilized.

Across both groups and all four disciplines it is remarkable that the most widely used form of Sampling was Convenience sampling. The Pure disciplines as a group used

Convenience sampling more frequently by a 2.6:1 ratio to all other methods, and the Applied disciplines utilize Convenience sampling in a 1.25:1 ratio compared to all other methods combined. Psychology articles, in particular, use Convenience sampling about eight times more frequently than all other methods combined, a result expected given the homogeneous nature of most samples of psychological subjects. It is interesting to note that even though Psychology makes heavy use of Experimental designs (see table 4.4) many of these do not follow the Experimental design tenet of Probability sampling. It is well demonstrated in many of the articles sampled that there is a tendency in Psychology research to draw upon undergraduate Psychology students (a Convenience sample) as study subjects and then randomly assign them to an experimental or control condition in an Experimental design.

Data Collection Differences

Analyzing the differences in the eight data collection methods across the Pure and Applied groups showed significant differences (Chi Square = 123.95, $p < .001$). The there were four major contributing elements based on standardized residuals. Three data collection methods: Questionnaire/open, Observation/unstructured, and Interview/open were all used to a significantly greater degree in the Applied group, corresponding to the greater use of qualitative methods utilizing these procedures. The other contributing difference was in the use of Secondary Data, much more prevalent in the Pure group. Within the Pure group, Secondary Data is much more preferred in Sociology, where the subject matter lends itself to the utilization of secondary data sources like census and historical records. Frequencies of the eight data collection methods across the disciplines and groups are shown in Table 4.8.

In the analysis of differences in Data Collection methods within the disciplines Chi Square analysis was not valid in the comparison between Psychology and Sociology due to low cell counts. However the lack of cell counts is due to the fact that the vast majority (73%) of

articles in Sociology used Secondary Data as the Data Collection method compared to a more evenly distribution of methods across the Psychology articles. Analysis of the differences between Nursing and Education did reveal significant results (Chi Square = 77.82, $p < .001$). Standardized residuals indicate that these differences lie mostly in the variation in questionnaire use; Nursing articles used three times as many Questionnaire/closed method data collections as Education, and no Questionnaire/open types compared to twelve sampled from Education articles. Observation/unstructured was also seen in thirty Education articles as opposed to only two in Nursing articles.

Table 4.8

Data Collection Frequencies

	*Test/ Exp.	Quest./ closed	Quest./ open	Observ./ structured	Observ./ unstruct.	Int./ std.	Int./ open	Secondary
Pure								
Psychology	45	65	1	13	2	13	3	8
Sociology	2	4	0	0	7	11	16	110
Total	**47**	**69**	**1**	**13**	**9**	**24**	**19**	**118**
Applied								
Nursing	20	64	0	2	2	13	40	9
Education	40	20	12	5	31	3	27	12
Total	**60**	**84**	**12**	**7**	**33**	**16**	**67**	**21**

*Data Collection Methods: Test/Experiment, Questionnaire/closed, Questionnaire/open, Observation/structured, Observation/unstructured, Interview/standardized. Interview/open, Secondary Data

Paradigms and Paradigmatic Differences

The first part of the third research question asks if there is evidence of the differences in the underlying philosophical paradigms of the disciplinary groups in the Biglan classification. This evidence was uncovered in the research articles of the sample in an indirect and inductive process. Of all 600 research articles sampled, only one actually mentioned the underlying philosophical paradigm specifically as such, a Mixed Methods article which spoke of the paradigm of Pragmatism. Three other Mixed Methods articles made a less direct reference to Pragmatism as the foundation of the methodology. Thirteen of the nineteen articles with Phenomenological Research Designs made some reference to phenomenology as a philosophical foundation for the design, but did not connect it directly with any of the four research Paradigms described in this study. Five of the nineteen Critical Theory articles did identify some form of critical or participatory theory as the foundation of the methods used, but did not specifically identify them as a paradigmatic basis of the research.

For the vast majority of the research articles, there was no explicit mention of the philosophical or paradigmatic foundations of the articles. This result would not be as surprising if the sample articles were taken from journals published in the first half of the 20th century when the dominant methodological orientation for most disciplines in the social and behavioral sciences followed a positivist paradigm (Johnson & Christensen, 2004; Teddlie & Tashakkori, 2003). In such a world where the paradigmatic foundation of research methodology was assumed and unchanging, there would be no need for discussion. However, given the developments on Qualitative and Mixed Methods research beginning in the second half of the 20th century, and all of the debate which ensued in the paradigm wars (Gage, 1989; see also Guba, 1990), it is surprising that even in fields like Education which showed a good mix of methodologies in the articles sampled (see Table 4.2), that so few would ever make mention of

the differing paradigmatic foundations of the various preferred research methods. There is sufficient literature on the discussion about paradigmatic foundations and their compatibility to enable the kinds of operational definitions of Paradigm types as developed in this study for coding the sample articles (see pp. 96-104 above). The finding based on the sample of articles studied here is that such discussion does not typically enter into published research articles.

For the purposes of coding, therefore, Paradigm type was induced from the article type and the various methodological components and the common link between these components and a paradigmatic foundation. Specifically Quantitative research designs were taken to generally indicate Post/positivism, Mixed Method indicated Pragmatism, and Qualitative studies were linked with Constructivism.

Exceptions to this general rule included seventeen Qualitative articles which utilized Critical/Action/Participatory designs which were classified as a Critical Theory Paradigm. Additionally, two other Qualitative studies which did not use a Critical/Action/Participatory design were classified as Critical Theory. Nine Mixed Methods designs were classified as Post/positivism rather than Pragmatism because the mixed component of the design was so unconscious and overwhelmed by the quantitative aspects of the article. Table 4.9 gives the resulting frequencies of Paradigms by group and by discipline.

Analysis of the Paradigm frequencies showed that there were significant differences between the Pure and Applied groups (Chi Square = 62.28, $p < .001$). Additionally, the measure of association between the variables indicates that the relationship between the groups and Paradigms is not only significant but relatively strong (Cramer's V = .337). Standardized residuals for this analysis are shown in Table 4.10. The residuals show that the difference between the groups extends to three of the four Paradigms: Post/positivism, Pragmatism, and Constructivism, with Post/positivism and Constructivism accounting for the greatest degree of

difference. These results could be expected based upon a tendency of high impact journals in the pure sciences to reflect what Kuhn (1970) called the incommensurability of paradigms, i.e. in the pure sciences the nature of scientific questions does not allow for a choice of paradigms, and Post/positivism prevails.

Table 4.9

Paradigm Frequencies

	Post/Positivism	Pragmatism	Critical Theory	Constructivism
Pure				
Psychology	142	8	0	0
Sociology	116	7	4	23
Total	**258**	**15**	**4**	**23**
Applied				
Nursing	97	13	7	33
Education	69	29	8	44
Total	**166**	**42**	**15**	**77**

Table 4.10

Paradigms Standardized Residuals

	Post/Positivism	Pragmatism	Critical Theory	Constructivism
Pure	3.2	-2.5	-1.8	-3.8
Applied	-3.2	2.5	1.8	3.8

Summary

Overall, descriptive and statistical analyses showed that there were differences both between the Pure and Applied groups of disciplines as well as within the groups themselves. In most cases, however, the variation between groups was greater and more comprehensive than within the groups.

In answer to the first research question, significant differences were found between the uses of Quantitative, Qualitative, and Mixed Methods in research articles across the Biglan disciplinary groups. Analysis revealed that these differences apply across all three methodological types.

The answer to the second research question yielded mixed results. Significant differences were found between the groups across Quantitative Research Designs, but not with Mixed Methods or Qualitative Research Designs. Sampling Methods also revealed significant differences between the groups when Mixed Methods sampling was excluded from the analysis. Data Collection methods were also statistically different between the Pure and Applied groups.

Through inductive processes enough evidence was available in research articles to classify them according to the underlying Paradigm, in answer to the first part of the third research question. Further, once classified by Paradigm, the Pure and Applied groups were found to have significant differences in their preferences.

Finally, all the findings tend to support the validity of the Biglan scheme as a means of classifying disciplines based on their differences, and in this particular case, based on the differences in preferred research methodologies, the components of those methodologies, and the paradigms underlying them.

CHAPTER 5: DISCUSSION

Statistically significant findings of differences between the groups studied from the Biglan (1973a, 1973b) classification of disciplines form the starting point for discussion of the results of the study along three basic lines. First, the findings demonstrate the validity of the Biglan scheme in the case of the soft/life/pure versus soft/life/applied groups of disciplines with respect to preferences in research methods. These results further support the validity of the Biglan scheme as a whole. Second, the demonstrated differences between disciplines in their approach to knowledge production carry implications for the ability of researchers in different disciplines to collaborate and converse with one another in the research enterprise. The Biglan classification system is seen as a useful tool in this process. And third, the conclusions drawn present various directions for future study of the differences in research and other defining characteristics of disciplines across established groups.

Validating the Biglan Classification Scheme

The present study, like many others before (e.g. Hargens, 1996; Muffo & Langston, 1981; Smart & Elton, 1982) sought to validate the Biglan (1973a, 1973b) classification scheme for disciplinary differentiation and grouping. Unique to this study was the choice of preferred research methods as the means of validating differences between groups. Research methods were chosen as a means of comparison because they represent an essential output of disciplinary practice rather than the opinions of disciplinary practitioners, as in the studies carried out by Becher (1989) and Becher and Trowler (2001) to define disciplinary differences. Significant findings relative to the first two research questions about the preferred methodological types of articles published, and the specific methodological components of those articles validate the Biglan scheme for the groups studied. Validation of the soft/life/pure and soft/life/applied groups, which are both part of a more commonly accepted general association referred to as the

social and behavioral sciences, implies that other less similar Biglan groups would demonstrate equal or greater differences in their preferred methodological approaches.

Disciplinary Groups' Preferences for Basic Methodological Approaches to Research

Quantitative, Qualitative, and Mixed research methodologies were the primary variables upon which the Pure and Applied groups of disciplines in the soft/life classification group of Biglan's (1973a, 1973b) scheme were compared. The first research question was answered affirmatively: there are significant differences between the two groups based upon the frequency of their use of these methodological types in the publication of research articles.

Looking within the groups, Chi Square analysis revealed significant differences as well. However, within each group the differences between the two disciplines were predicated on a large variation in only one of the three methodological types. In the case of the Pure group, the total lack of Qualitative research articles in the Psychology sample accounted for the main difference with Sociology. It appears that to have an article published in the top five factored journals in Psychology researchers must use quantitative methods predominately. Qualitative methods in the articles sampled from these journals only made its appearance in designs which were Mixed Methods, and even there the Qualitative components were exclusively secondary. It would be interesting to see if the lack of Qualitative methods was consistent across a broader range of Psychology journals. One might also ask if a greater number of disciplines in the group were sampled whether or not the lack of preference for Qualitative research in Psychology would still result in significant differences within group differences. In any case, Psychology has been validated more than once (e.g., Malaney, 1986a; Stoecker, 1993) as part of this grouping, and the specific journals chosen were selected to be representative of the discipline at is core. As such the Psychology articles are an appropriate sample of the discipline to represent the characteristics of the disciplinary grouping.

There was a finding of significance within the Applied group as well. This difference was predicated largely on the greater preference for Mixed Methods in Education as opposed to Nursing. A possible explanation for this difference lies in the fact that Mixed Methods has been developed and promoted to a large extent by Education researchers (e.g., Creswell, 2002, 2003; Johnson & Christensen, 2004; Tashakkori & Teddlie, 1998, 2003). Given this fact, it would be expected that more Mixed Methods articles would be found in Education journals compared to Nursing. At the same time, it should be noted researchers in Nursing have shown interest in Mixed Methods since the early 1990s (Tashakkori & Teddlie, 2003) and so the gap may close in the future.

The Biglan (1973a, 1973b) classification system makes no claim that is groupings represent complete uniformity among the disciplines included. It is based on findings of greater similarities of the disciplines within the group as a group when compared with other disciplines grouped on the same criteria. As such, the findings of the present study validate this claim based on the two groups sampled. Even though there are differences in preferred research methods within the groups, the difference between the groups is more comprehensive. Chi Square analysis between the groups showed that significant differences are accounted for by substantial variation in preferences for all three types of methodological approaches, Quantitative, Qualitative, and Mixed Methods (see Table 4.3). While the significance of differences within the groups in each case hinge on a single methodological approach, the significant difference between the groups is more comprehensively based upon differences in preferences for all three methodological approaches to research, as found in the published work of each discipline.

These differences can be seen as corresponding with the historical development of new research methods over the last fifty years. Even though many Qualitative methods originated in the Pure disciplines of Psychology and Sociology (Creswell, 1998), over the years the use of this

methodology took firmer root in Applied disciplines like Education and Nursing. The findings here concerning preferred research methodologies are evidence of this development which indicate a weaker alliance to established Paradigms in the Applied group. Further, issues in the subject matter of the Applied disciplines often lend themselves to the application of Mixed Methods. For example, in the discipline of Education studies of school effectiveness often used Mixed Methods to answer their research questions because this approach offers the broadest array of techniques to answer questions which frequently involve various traditions of research and a varied and large target audience (Tashakkori & Teddlie, 2003; Teddlie & Reynolds, 2001).

Differences in Preference for Specific Methodological Components of Research Articles

The second research question takes the first question one step further. If the Biglan (1973a, 1973b) groups are significantly different based on the most elemental approach to research in terms of Quantitative, Qualitative, and Mixed Methods article types, the second question asks if significant differences can also be found in the various components of these types. The study's findings of significant differences here adds another level of validity to the Biglan system, showing that even on the more specific level of research tools the two group vary in their preferences.

In terms of the most basic component, Research Design, the findings showed that the Pure and Applied groups differed significantly in terms of Quantitative designs. This difference is primarily accounted for by the lack of Survey designs in the Pure group sample. This result is surprising in the sense that Psychology and Sociology are both disciplines in which the opinions, beliefs, and attitudes of people (the focus of a Survey design) are important to the subject matter in these fields. Yet in the empirical research studied here, these disciplines chose other Quantitative designs to study these population characteristics, mostly the Causal Comparative and Correlational designs favored by this group relative to the use of these designs in the Applied

group. It is also interesting that Experimental designs as a percentage of total Quantitative designs is higher in the Applied group than in the Pure group (see Table 4.4) where again the expectation might be for a greater use of experimentation. In any case, the results show that the disciplines in the two groups vary in their preference for Quantitative research designs and this contributes to the validity of the classification system.

The two groups also differed significantly in their choice of Sampling Methods (see Table 4.7). The notable finding in this case is the dependence of the Pure group on Convenience sampling. The results showed that convenience sampling is favored over all other methods combined by a more than 2.5 to 1 ratio. The common use of Convenience sampling was in Quantitative type articles in the Pure group. This factor along with the heavy use of Purposive sampling in the Applied group (corresponding to the greater use of Qualitative methods in that group) results in a significant difference between the groups. This difference is the second methodological component result to contribute to the overall validity of group differences based on the Biglan system.

The third methodological component which supports the distinction between the Pure and Applied groups is Data Collection Methods (refer to Table 4.8). The major difference between the groups is the preference in the Applied group for open and unstructured data collection instruments. Open Ended Questionnaires and Interviews as well Unstructured Observation are used to a greater degree in the Applied group. Secondary Data, conversely, is more frequently used in the Pure group due to the nature of the subject matter in those disciplines which favors population study.

Taken together the findings relative to these three methodological components gives an affirmative answer to the second research question: there are significant differences in some of the fundamental components of research methods across the two Biglan groups studied.

Contribution of the Present Study to Validation of the Biglan Classification System

As indicated earlier in the literature review, empirical validations of the Biglan (1973a, 1973b) classification system fall into three groups: those which seek to establish the applicability of the model across various types of higher education institutional settings, those which seek to establish the validity of the model over a broader variety of disciplines, and those which use the model as a framework for investigating more specific issues of disciplinary variation. The present study is situated in the third group. The study of preferred research methods explores a specific issue of disciplinary variation, which is a key to understanding the larger picture of research as one of the fundamental components of the higher education enterprise.

More specifically, the present findings add another piece of empirical evidence to that amassed so far in support of the Pure versus Applied distinction in the Biglan scheme. The present study adds to a long list of findings that support the validity the Pure versus Applied classifications in the Biglan scheme: Smart and McLaughlin's (1978) study of reward structures, Muffo and Langston's (1981) survey of faculty salaries, Creswell and Bean's (1981) look at sources of faculty funding, Malaney's (1986b) study of the characteristics of graduate students, Paulsen and Wells' (1998) evidence on epistemological beliefs, Pike and Killian's (2001) investigation of college experiences and learning outcomes, Sinclair and Muffo's (2002) work on student perceptions of writing, Whitmire's (2002) inquiry into information-seeking behavior, and Del Favero's (2006) investigation into administrative behavior.

The unique contribution of this study is that it looks for the first time at research methods as a point of comparison between disciplines. As such it touches on a core component of what defines a discipline in terms of how it approaches knowledge production (Braxton & Hargens, 1996). Further is makes this distinction based on the output (published empirical research) rather than the opinions of disciplinary practitioners (as in Smart and Elton, 1982 or Kekale, 1999).

While other studies have looked at more superficial data like research citation patterns (Hargens, 1996) or research funding (Smart & Elton, 1982), the present study goes into the deeper workings of the research function and its resulting outputs to validate the Biglan system. In this way, the present study adds not just breadth as one more validation of the Biglan classes, but also adds depth to the previous empirical validations of the system through the consideration of research methodology, which is a key component reflecting the degree of paradigmatic consensus in a discipline (Becher, 1994; Braxton & Hargens, 1996).

Although the study only looks at two of the eight Biglan (1973a, 1973b) groupings, the two groups chosen were purposely done so in order to draw inference to other groups. The two groups (soft/life/pure and soft/life/applied) which encompass the closely related disciplines known as the social and behavioral sciences were chosen because the distinctions drawn there can logically be inferred to other groups not so closely related. That is to say, the significant differences found between the soft/life/pure and soft/life applied groupings which are composed of the related disciplines of the social and behavioral sciences can logically imply that other disciplines in less closely related groups would also yield findings of significant differences in preferred research methodologies. For example, based on the present findings it is reasonable to assume that a comparison of the soft/life/applied group (e.g. Education and Nursing) with the hard/pure/nonlife group (e.g. Astronomy and Geology) would result in significant differences in preferred research methods. Likewise, a similar comparison of the soft/life/pure group (e.g. Psychology and Sociology) with the hard/nonlife/applied group (e.g. Computer Science and Engineering) would be expected to show significant differences as well. Such distinctions remain to be empirically verified, but the findings of this study strongly suggest that the findings would be similar.

The Biglan Classification System as a Tool for Promoting Interdisciplinary Discourse on Research

Based on the validation of the Biglan (1973a, 1973b) classification system for grouping disciplines relative to their different approaches to research and knowledge production, the scheme can be seen as a tool to be used by the researchers of various disciplines to understand their colleagues and potentially collaborate with them. The starting point of this discussion is the present study's consideration of the paradigmatic foundations of research methodologies. The varying paradigms, or world views, their compatibility and the directions they give to the approach to research are key to any interdisciplinary effort. Having established paradigmatic differences, and the resulting differences in research methodologies between the disciplinary groups, there are yet possibilities for interdisciplinary discourse and research efforts. The differences and similarities discovered in the present study provide some evidence of how the Biglan scheme can be used as a tool of understanding and communication in these efforts.

Research Paradigms and the Implications of the Study Findings

The research conducted in this study found that explicit discussion of the underlying research paradigms for particular methodological choices is rare in published articles. This is not surprising for two reasons. First, such discussions are probably not useful within a single discipline where the paradigms are generally assumed, if not always consciously articulated. Second, the limitations on publication by editors would preclude such discussions unless they were critical to the conclusions of the research. Hence the findings show only one in 600 articles with an explicit discussion of paradigmatic foundations. Further, only a handful mention underlying principles by necessity; for example, some of the articles utilizing Phenomenological methods touched on the philosophical grounding of this method in phenomenology, and some Critical Theory articles needed to state the particular participatory or emancipatory approach among several that founded the particular action research.

Nevertheless, it was possible to induce from the research methodologies utilized in the articles the underlying paradigms. As such, significant differences were found between the Pure and Applied groups based on Paradigm choice. These differences are primarily accounted for by the heavy favoritism of the Pure group for Post/Positivism, and the relatively high incidence of Constructivism and Pragmatism in the Applied group.

Notable in the findings is the dominance of Post/Positivism as a paradigm for published empirical research in both groups. Over 55% of the Applied group articles and an amazing 86% of the Pure group articles were based in the Post/Positivist paradigm. Even fifty years after the introduction and acceptance of Qualitative methods and the underlying Constructivist paradigm, the editorial boards (and/or the researchers making submissions) of top impact journals in all the disciplines studied still seem to favor Post/Positivism as the foundation for empirical research. It should also be noted that in the Applied group, even given the predominance of Post/Positivism, there is a distribution across all four Paradigms coded.

What do these findings imply for communication and collaboration of researchers across groups and disciplines? First, although the "paradigm wars" (Gage, 1989, p. 5) have long ended and the "incompatibility thesis" (Tashakkori & Teddlie, 1998, p. 4) has been discredited, there nevertheless remains a strong practical preference for the Post/Positivist paradigm. Even so, the results demonstrate the growing acceptance of the view that research methods should follow research questions in a way that gives the best opportunity for useful answers (Johnson & Onwuegbuzie, 2004), and that this view has taken root particularly in the disciplines of the Applied group where various paradigms are in use.

It is important to note that with the exception of Psychology, the sample showed that all four paradigms are used in each of the disciplines studied. Psychology lacked any Critical Theory or Constructivism based articles in the sample. It has already been suggested this may be

the result of Kuhn's (1970) concept of the incommensurability of paradigms, which suggests that in the pure sciences the very nature of the questions dictates the Post/Positivist approach. It may also be the result of a lingering attitude among researchers and editors that still believes in the superiority of Post/Positivism and the Quantitative methods it engenders.

It is clear that the call that Guba (1990) made more than a decade and a half ago for paradigm dialogue is still relevant today. If researchers from various disciplines are to both expand the horizons of their own research possibilities, as well as explore the potential for research collaboration with researchers in their own discipline operating out of different paradigms as well as those in other disciplines, then they need to engage in dialogue with researchers coming from other world views.

The findings of Paradigm frequencies in the present sample indicate that there is serious research being done in both the Pure and Applied groups which is based in all four Paradigms. About 15 % of the research articles sampled in the Pure group came out of Paradigms other than Post/Positivism, and nearly 45% of those in the applied group used other Paradigms. The fact that this research is published in high impact journals indicates that these paradigmatic foundations have some degree of acceptance. This acceptance is certainly a common starting point of dialogue across the groups and disciplines.

The Biglan System of Classification as a Tool for Disciplinary Dialogue on Research

This study and its results serve not only as a means of validating the Biglan (1973a, 1973b) scheme of classifying disciplines into similar groups based on significant differences between them, but also serves to show how this system of classification can be used as a vehicle of understanding that assists researchers to understand the different methodologies and underlying paradigms being used in their own discipline as well as others. As such, the Biglan

groupings can be a tool to promote intra- as well as interdisciplinary dialogue through recognition of the differences and similarities present in the various groups.

As disciplinarity grows more complex and diverse, it presents a unique opening for interdisciplinary dialogue and discourse (Lattuca, 2001). The argument has been made that knowledge itself is increasingly interdisciplinary, and this also urges interdisciplinary discourse in knowledge production (Klein, 1996). Interdisciplinary efforts have been undertaken in urban studies, environmental studies, women's studies, and cultural investigations (Klein, 1996). There has also been a good deal of interdisciplinary work in professional fields such as education, business, and social work. There have even been efforts in the social sciences and humanities to use interdisciplinary work to deconstruct disciplinary boundaries and power structures (Lattuca, 2001). All of these initiatives underscore the importance of having the means of facilitating interdisciplinary dialogue, in particular in the promotion of interdisciplinary research efforts.

In the interdisciplinary discourse, assumptions about the criteria for conducting interdisciplinary work are strongly disciplinary. That is, competing formulations meet in the determination of how interdisciplinary work gets done, and appropriate criteria are created in a process of discovery across the boundaries of disciplinary research criteria (Klein, 1996; Lattuca, 2001). Doing interdisciplinary research therefore requires negotiation on disciplinary assumptions and preferences in order to ensure successful collaboration (Lattuca, 2001).

The results of the present investigation illustrate how the Biglan groupings could be used to facilitate interdisciplinary negotiations relative to research methodologies. Taking the example of an Education (Applied group) researcher wishing to collaborate on a study with a Psychology (Pure group) researcher, the first point of note would be that a purely Qualitative study may not be feasible, in particular if it was desired to publish the research in a Psychology

journal. Findings on preferred methodologies (see Table 4.2) show that in the sample of 150 research articles there were no Qualitative articles published at all. If, on the other hand, publication in an Education journal is desired, then Qualitative methods would be acceptable. Even so, from the evidence of the study in which the entire Pure group demonstrated a lower acceptance of Qualitative research, another approach might be in order. If the researchers really wanted to incorporate Qualitative methods, then a Mixed Methods approach might be best, based on the results which show its acceptance in both groups and all four disciplines, indicating not only the willingness of editors to publish this research but also the desire of researchers to pursue this avenue of inquiry.

Continuing with the same example, when the components of the research design were being formulated, a Survey design might not prove to be the best choice, since the Pure group in the study had no Survey articles at all. A Correlational study would seem to be more appropriate as a Research Design acceptable to both groups and one which could accomplish the same goal as a Survey design. Going a step further, based on Biglan group comparisons, if a Mixed Methods design were desired, a Quasi-Mixed Monomethod or a Sequential Mixed design would be most agreeable based on the results of Biglan group comparisons of Mixed Methods research designs (see Table 4.5). Sampling would be most easily agreed upon if it were Probability or Convenience sampling based again on Biglan group preferences (see Table 4.7). And when it came to Data Collection methods, most should be acceptable as long as they were not open-ended or unstructured (see Table 4.8).

The above example illustrates but one means of utilizing information from a single study that could be used by researchers to promote dialogue and collaboration in their research efforts based on the characteristics of their disciplinary group as classified in the Biglan system. In the

next section, other possible studies are indicated which could further promote understanding across the disciplines with particular regard for their research enterprise.

Conclusion and Directions for Future Research

This study has shown the Biglan classification of disciplinary groupings to be valid for distinguishing preferred research methodologies in the soft/life/pure and soft/life/applied groups of the system. It is suggested that the validity of this scheme makes it a useful tool for the promotion of intra- and interdisciplinary dialogue on research and collaborative research efforts. These conclusions are tempered by the limitations of this study, and along with these limitations suggest directions for future research on the topic of disciplinary differences relative to varying research methodologies and paradigmatic foundations.

Limitations of the Present Research

The major limitations of the present study revolve around the limited scope of the research. The limitations in scope include a single circumscribed data source, limited inter-rater reliability, and the testing of only two of eight Biglan groups.

Only one source of data, research journal articles was used in the study. While the journal articles were chosen specifically on their strength as an objective source of research output to evaluate disciplinary differences, they still represent only one type of data. The study could be enhanced and credibility improved through data triangulation. This could be done, for example, in the form of a survey or interviews of disciplinary researchers concerning the choices they make when planning research methods.

Furthermore, the data source was limited to upper echelon journals from each discipline based on a combination of impact factor and number of citations. While this method was utilized to select a sample that represents what is typically published in the discipline, it is

certainly not comprehensive of disciplinary practice. Therefore the conclusions of the study are based on what is typically published, not what is comprehensively practiced in the discipline.

The inquiry audit technique was utilized to insure the consistency and dependability of article analysis through the use of detailed and exact operational definitions of the coding method. The credibility of this technique was enhanced by investigator triangulation in the form of independent coding by a second coder. For this study only one other coder was used and acceptable Cohen's Kappa statistics were obtained for the reliability of the instrument. However, this reliability would further be enhanced with the use of multiple coders and the comparison of Cronbach's Alpha statistics from such coding with the Cohen's Kappa statistics reported here.

In terms of statistical tests, one limitation is that only Chi-Square tests were used for determining significance. In the case where the expected values were too small for a valid Chi-Square result, G tests for independence or the Fischer's Exact Test could have been used. There were also cases where some variables had zero frequency making statistical comparisons inaccurate.

Finally, only two of the eight groups in the Biglan (1973a, 1973b) classification were studied. The two groups were specifically chosen to infer the conclusions to the whole scheme, but conclusive validation of the Biglan scheme would require a complete analysis of all eight groups.

Directions for Future Research

The limitations mentioned as well as some of the unexpected findings highlighted above point out various avenues for future research endeavors. These future research projects are summarized in Table 5.1 and the particular aspects of each are discussed in turn.

Table 5.1

Future Research Questions and Possible Data Sources

Research Questions	Data Sources
Are there any Qualitative studies published in Psychology journals? If so, what are the characteristics of these journals?	Articles from a random sample of the full range of Psychology journals selected from a comprehensive list.
Are there any Survey studies published in Psychology or Sociology journals? If so, what are the characteristics of these journals?	Articles from a random sample of the full range of Psychology and Sociology journals selected from a comprehensive list.
What are the academic origins of the authors of the articles, and how might these influence paradigmatic and methodological preferences?	A comparison of academic backgrounds of disciplinary journal authors with methodological preferences.
How is the continued dominance of Post/Positivism in published research explained?	Inquiry into the paradigmatic views of editors of high impact journals through a survey instrument and/or interviews.
Can the results of the present study be further validated in the beliefs and opinions of research practitioners?	A survey of the opinions of the researchers whose articles were sampled for this study.
Can the results of the present cross-sectional study be reproduced in a longitudinal study?	Disciplinary research articles sampled across a longer period of time, e.g. five or ten years.
Are the results of the present study confirmed in a broader spectrum of disciplinary journals?	A maximum variation sample of articles from each discipline moving beyond just high impact journals to a more comprehensive list.
Are the findings of the present study for two groups of the Biglan system confirmed in all eight groups?	A representative sample of journal articles from selected disciplines in all eight Biglan groups.

(Table 5.1 continued)

Do other more exact statistical tests confirm the broad results of the Chi-Square analysis?	Subjecting the same sample to different statistical tests when sample sizes are very small, such as the G test or Fischer's Exact test.
Are the differences in preferred research methodologies of Biglan groups found here also demonstrated in other classification schemes (e.g. that of Becher)?	A sample of journal articles from disciplines which are classified as soft/pure and/or soft/applied both in Biglan and Becher's systems.
What are the philosophical differences (epistemology, ontology, etc.) between disciplinary groups underlying the paradigmatic differences found in the present study?	Interviews with researchers in disciplinary groups inquiring into their philosophical beliefs regarding knowledge acquisition and production.

The lack of Qualitative studies found in the Psychology articles sampled, and the lack of Survey Designs in the sample for both Psychology and Sociology lead to two research questions focusing on the possibility that these types of articles may be found in journals beyond the upper impact echelon selected in the present study. Articles could be chosen from a fuller sample which would be randomly selected from a comprehensive list of journals in the discipline.

There is a possibility that the trends in certain disciplines, for example no Qualitative studies in Psychology or the high frequency use of Phenomenological designs in Nursing could be influenced by the academic backgrounds of the authors. An investigation into the academic training of the authors in addition to the other information about methodological preferences gathered in the sample would provide data to make such a comparison.

The finding that the Post/Positivist paradigm still holds sway, at least in research published in high impact journals, could also be further investigated. Interviews or a survey of journal editors from these journals may shed light on the underlying rationale for maintaining the

dominance of Post/Positivism and the associated Quantitative research methods in their editorial policy. The opinions and views of the high impact journal editors could also be contrasted with the views of editors of journals in the same discipline that publish more Qualitative and/or Mixed Methods research articles, which are reflective of other Paradigms.

To further validate the results of the present study and expand understanding of the choices of methodological approaches in the disciplinary groups, other sources of data could be obtained. Most directly, a follow-up to the present study could be conducted in which researchers in each of the four disciplines were surveyed about the conclusions found here. Such a study would have the potential not only for confirming the results presented here, but for expanding the explanation for why certain methodological preferences exist. Researchers could be asked about their success or failure in interdisciplinary projects, and if they felt the ability of the Biglan groupings to highlight differences and similarities would assist them in future interdisciplinary research efforts. This could also be combined with the investigation into academic origins mentioned above.

One follow-up study to the present cross-sectional study would be to make the same comparison with a longitudinal sample. Research articles could be sampled from a longer time period, say five or more years to see if preferences found in the single time period of the present study could be validated across time. It would be interesting to see if any trends in preferences could be discovered.

Another possibility for a follow-up study would be to use a different purposive technique in selecting the research journals for sampling. Instead of a typical sample as in the current study, a maximum variation sample could be taken in an attempt to more comprehensively represent the disciplines in the groups. The selection technique to choose not only upper echelon

journals but also other journals representative of the discipline would be more complex and probably require consultation with disciplinary experts.

Future research to definitively validate the Biglan classifications relative to preferred research methodologies would require systematic comparison of all eight groups in the scheme. Such a study would most likely be an interdisciplinary effort in itself, since it would require relatively sophisticated knowledge of the research methods utilized in the full range of disciplines present in most university and college settings. The process itself of conducting such a study could yield useful information on interdisciplinary research collaboration. That is to say, the methodology of such a study would be an exercise in the very subject of its research.

It would also increase the validity of the present findings to confirm the Chi-Square tests conducted here with different statistical tests. This would be especially important in those comparisons with very small sample sizes that yield inaccurate results with the Chi-Square analysis. The G test for independence or Fischer's Exact test would be possible alternatives to Chi-Square.

Yet another direction for future study would be to compare preferred research methodologies as demonstrated in the Biglan (1973a, 1973b) classification with other classification schemes such as that of Becher (1989). For example, a sample of research articles from the Pure and Soft or Applied and Soft disciplines in Becher's Cognitive Dimension (see Table 2.1) could be compared with a sample from the soft/life/pure or soft/life/applied disciplines of Biglan groups (see Table 1.1) to see if there is a correlation. Such a research objective was suggested by Braxton and Hargens (1996) over ten years ago, but to date has not been undertaken, most likely due to the difficulty in collecting the extensive data required, as suggested by Becher (1994) himself.

Finally, the present study focused on preferred research methods as a way of validating the differences in these preferences across the Biglan disciplinary groupings. In this process of investigation, the paradigmatic foundations of research methodology were also examined because of their link to the various approaches to research methodology. More specifically, research paradigms are important in the attempt to understand the reasons why certain methods are chosen. Understanding the variation across disciplines of paradigms delves into the way researchers think about knowledge acquisition and production, and the world views which generate those ways of thinking. Future studies concerning paradigmatic foundations of research would then touch upon more fundamental philosophical issues epistemology, ontology, axiology, and logic (as in Table 2.2). Comparisons could be made between the philosophical world views of researchers and the ways in which they approach the subject matter of their discipline. And once again the Biglan model of grouping disciplines could be a vehicle for making these comparisons.

REFERENCES

Aron, A., Aron, E. N., & Coups, E.J. (2006). *Statistics for psychology* (4th ed.). Upper Saddle River, NJ: Prentice Hall.

Babbie, E. (2002). *The basics of social research* (2nd ed.). Belmont, CA: Wadsworth Publishing.

Barnes, L. L., Agago, M. O., & Coombs, W. T. (1998). Effects of job-related stress on faculty intention to leave academia. *Research in Higher Education 39* (4), 457-469.

Bayer, A. E. (1987). The Biglan model and the Smart messenger: A case study in eponym diffusion. *Research in Higher Education 26* (2), 212-223.

Becher, T. (1981). Towards a definition of disciplinary cultures. *Studies in Higher Education 6* (2), 109-122.

Becher, T. (1984). The cultural view. In B. R. Clark (Ed.), *Perspectives on higher education: Eight disciplinary and comparative views* (pp. 165-198). Berkeley, CA: University of California Press.

Becher, T. (1987). The disciplinary shaping of the profession. In B. R. Clark (Ed.), *The academic profession: National, disciplinary and institutional settings* (pp. 271-303). Berkeley, CA: University of California Press.

Becher, T. (1989). *Academic tribes and territories: Intellectual enquiry and the cultures of disciplines*. Milton Keynes, England: Open University Press.

Becher, T. (1994). The significance of disciplinary differences. *Studies in Higher Education 19* (2), 151-161.

Becher, T. & Trowler, P. R. (2001). *Academic tribes and territories: Intellectual inquiry and the culture of disciplines* (2nd ed.). Buckingham, England: Open University Press.

Berg, B. L. (2004). *Qualitative research methods for the social sciences.* (5th ed.). Boston, MA: Allyn & Bacon.

Bergh, I., Jakobsson, E., Sjostrom, B., & Steen, B. (2005). Ways of talking about experiences of pain among older patients following orthapaedic surgery. *Journal of Advanced Nursing 52* (4), 351-361.

Beyer, J. M. (1978). Editorial policies and practices among leading journals in four scientific fields. *Sociological Quarterly 19* (1), 66-88.

Biglan, A. (1973a). The characteristics of subject matter in different academic areas. *Journal of Applied Psychology 57* (3), 195-203.

Biglan, A. (1973b). Relationships between subject matter characteristics and the structure and output of university departments. *Journal of Applied Psychology 57*(3), 204-213.

Bogdan, R. C., & Biklen, S. K. (1982). *Qualitative research for education: An introduction to theory and methods*. Boston, MA: Allyn & Bacon.

Braxton, J. M. (1989). Institutional variability in faculty conformity to the norms of science: A force of fragmentation in the academic profession? *Research in Higher Education 30* (4), 419-433.

Braxton, J. M. (1990). Deviancy in the norms of science: A test of control theory. *Research in Higher Education 31* (5), 461-476.

Braxton, J. M., & Hargens, L. L. (1996). Variations among academic disciplines: Analytical frameworks and research. In J. C. Smart (Ed.), *Higher education: Handbook of theory and research* (Vol. 11, pp. 1-46). New York: Agathon Press.

Bresser, R. K. (1984). The context of university departments: Differences between fields of higher and lower levels of paradigm development. *Research in Higher Education 20* (1), 3-15.

Brew, A. (2001). Conceptions of research: A phenomenographic study. *Studies in Higher Education 26* (3), 271-285.

Bryman, A. (2006). Paradigm peace and the implications for quality. *International Journal of Social Research Methodology 9* (2), 111-126.

Cashin, W. E., & Downey, R. G. (1995). Disciplinary differences in what is taught and in students' perceptions of what they learn and how they are taught. *New Directions in Teaching and Learning 64*, 81-92.

Clark, B. R. (1983). *The higher education system: Academic organization in cross-national perspective*. Berkeley, CA: University of California Press.

Clark, B. R. (Ed.). (1984). *Perspectives on higher education: Eight disciplinary and comparative views*. Berkeley, CA: University of California Press.

Clark, B. R. (1987a). *The academic life: Small worlds, different worlds*. Princeton, NJ: The Carnegie Foundation.

Clark, B. R. (Ed.). (1987b). *The academic profession: National, disciplinary and institutional settings*. Berkeley, CA: University of California Press.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Cole, S. (1979). Age and scientific performance. *American Journal of Sociology 84* (4), 958-977.

Cole, S. (1983). The hierarchy of the sciences? *The American Journal of Sociology 89* (1), 111-139.

Collins, R. (1975). *Conflict sociology: Toward an explanatory science.* New York: McGraw Hill.

Cook, T. D., & Campbell, D. T. (1979). *Quasiexperimentation: Design and analysis issues for field settings.* Boston: Houghton Mifflin.

Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions.* Thousand Oaks, CA: Sage Publications.

Creswell, J. W. (2002). *Educational research: Planning, conducting, and evaluating quantitative and qualitative research*. Upper Saddle River, NJ: Pearson Education.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches.* Thousand Oaks, CA: Sage Publications.

Creswell, J. W., & Bean, J. P. (1981). Research output, socialization, and the Biglan model. *Research in Higher Education 15* (1), 69-91.

Creswell, J. W., & Miller, G. A. (1997). Research methodologies and the doctoral process. *New Directions for Higher Education 99*, 33-46.

Creswell, J. W., Plano-Clark, V., Gutmann, M., & Hanson, W. (2003). Advanced mixed methods research designs. In A. Tashakkori & C. Teddlie (Eds.) *Handbook of mixed methods in social and behavioral research* (pp. 209-240). Thousand Oaks, CA: Sage Publications.

Creswell, J. W., & Roskens, R. W. (1981). The Biglan studies of disciplinary differences among academic areas. *Review of Higher Education 4* (3), 1-16.

Datta, L. (1994). Paradigm wars: A basis for peaceful coexistence and beyond. In C. S. Reichardt & S. F Rallis (Eds.), *The qualitative-quantitative debate: New perspectives* (pp. 53-70). San Francisco: Jossey-Bass

Del Favero, M. (2003). Academic disciplines. In J. W. Guthrie (Ed.), *Encyclopedia of education* (pp. 9-14). New York: Macmillan.

Del Favero, M. (2006). An examination of the relationship between academic discipline and cognitive complexity in academic deans' administrative behavior. *Research in Higher Education 47* (3), 281-315.

Denzin, N. K., & Lincoln, Y. S. (Eds.). (1994). *The handbook of qualitative research*. Thousand Oaks, CA: Sage Publications.

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2000). *The handbook of qualitative research* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Denzin, N. K., & Lincoln, Y. S. (Eds.). (2005a). *The Sage handbook of qualitative research* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Denzin, N. K., & Lincoln, Y. S. (2005b). The discipline and practice of qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.) *The Sage handbook of qualitative research* (3rd ed.) (pp. 1-32). Thousand Oaks, CA: Sage Publications.

Durkheim, E. (1984). *The division of labor in society* (W. D. Halls, Trans.). New York: Free Press. (Original work published 1902).

Faricy, W. G. (1974). Grouping departments. *The Journal of Higher Education 45* (2), 98-111.

Flexner, H. (1979). The curriculum, the disciplines, and Interdisciplinarity in higher education: Historical perspective. In J. J. Kockelmans (Ed.), *Interdisciplinarity and higher education* (pp. 93-122). University Park, PA: The Pennsylvania State University Press.

Fuchs, S. (1992). *The professional quest for truth: A social theory of science and knowledge*. Albany, N.Y.: State University of New York Press.

Gaston, J. (1978). *The reward system in British and American science.* New York: Wiley-Interscience.

Greene, J. C. (2005). The generative potential of mixed methods inquiry. *International Journal of Research & Method in Education 8* (2), 207-211.

Greene, J. C., Caracelli, V.J. (Eds.). (1997). *Advances in mixed-method evaluation: The challenges and benefits of integrating diverse paradigms*. San Francisco: Jossey-Bass.

Gage, N. L. (1989). The paradigm wars and their aftermath: A "historical" sketch of research and teaching since 1989. *Educational Researcher 18* (7), 4-10.

Gauch, H. G., Jr. (2003). *Scientific method in practice*. Cambridge, U.K.: Cambridge University Press.

Guba, E. G. (1990). *The paradigm dialog*. Newbury Park, CA: Sage Publications.

Guba, E. G., & Lincoln, Y. S. (1982). Epistemological and methodological bases of naturalistic inquiry. *Educational Communication and Technology: A Journal of Theory, Research, and Development 30* (4), 233-52.

Guba, E. G., & Lincoln, Y. S. (1988). Do inquiry paradigms imply inquiry methodologies? In Fetterman, D. M. (Ed.), *Qualitative approaches to evaluation in education* (pp. 89-115). New York: Praeger.

Guba, E. G., & Lincoln, Y. S. (1994). Competing paradigms in qualitative research. In N. K. Denzin & Y. S. Lincoln (Eds.), *Handbook of qualitative research* (pp. 105-117). Thousand Oaks, CA: Sage Publications.

Guba, E.G., & Lincoln, Y. S. (2005). Paradigmatic controversies, contradictions, and emerging confluences In N. K. Denzin & Y. S. Lincoln (Eds.), The *Sage handbook of qualitative research* (3rd ed.) (pp. 191-216). Thousand Oaks, CA: Sage Publications.

Hagstrom, W. O. (1964). Traditional and modern forms of scientific teamwork. *Administrative Science Quarterly 9* (3), 241-263.

Hagstrom, W. O. (1965). *The scientific community*. New York: Basic Books.

Hargens, L. L. (1975). *Patterns of scientific research*. Washington, D. C.: American Sociological Association Rose Monograph Series.

Hargens, L. L. (1996, November). *Interpreting Biglan's "hard-soft" dimension of disciplinary variation*. Paper presented at the annual meeting of the Association for the Study of Higher Education, Memphis, TN.

Hargens, L. L., & Kelly-Wilson, L. (1994). Determinants of disciplinary discontent. *Social Forces 72* (4), 1177-1195.

Howe, K. R. (1988). Against the quantitative-qualitative incompatibility thesis or dogmas die hard. *Educational Researcher 17* (8), 10-16.

Hutchinson, S. R., & Lovell, C. D. (2004). A review of methodological characteristics of research published in key journals in higher education: Implications for graduate research teaching. *Research in Higher Education 45* (4), 383-403.

Johnson, R. B., & Christensen, L. (2004). *Educational research: Quantitative and qualitative, and mixed approaches* (2nd ed.). Boston: Allyn and Bacon.

Johnson, R. B., & Onwuegbuzie, A. J. (2004). Mixed methods research: A research paradigm whose time has come. *Educational Researcher 33* (7), 14-26.

Journal Citation Reports. (2005). *Social Sciences Edition.* Thompson ISI.

Kekale, J. (1998). Academic leaders and the field of possibilities. *International Journal of Leadership in Education 1* (3), 237-255.

Kekale, J. (1999). 'Preferred' patterns of academic leadership in different disciplinary (sub)cultures. *Higher Education 37*(3), 217-238.

Kekale, J. (2001). *Academic leadership.* Huntington, NY: Nova Science Publishers.

Kemmis, S., & McTaggart, R. (2005). Participatory Action Research: Communicative action and the public sphere. In N. K. Denzin & Y. S. Lincoln (Eds.), The *Sage handbook of qualitative research* (3rd ed.) (pp. 559-603). Thousand Oaks, CA: Sage Publications.

Kemper, E.A., Stringfield, S., & Teddlie, C. (2003). Mixed-methods sampling strategies in social science research. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 273-296). Thousand Oaks, CA: Sage Publications.

Klein, J. T. (1996). *Crossing boundaries: Knowledge, Disciplinarities, and Interdisciplinarities.* Charlottesville, VA: University Press of Virginia.

Kockelmans, J. J. (Ed.). (1979). *Interdisciplinarity and higher education*. University Park, PA: The Pennsylvania State University Press.

Krathwohl, D. R. (1998). *Methods of educational and social research: An integrated approach* (2nd ed.). New York: Addison Wesley Longman.

Kuh, G. D., & Whitt, E. J. (2000). Culture in American colleges and universities. In M. C. Brown, II. (Ed.), *Organization & governance in higher education* (5th ed.). Boston, MA: Pearson Custom Publishing.

Kuhn, T. S. (1962). *The nature of scientific revolutions*. Chicago: University of Chicago Press.

Kuhn, T. S. (1970). *The nature of scientific revolutions* (2nd ed., enlarged). Chicago: University of Chicago Press.

Lattuca, L. R. (2001). *Creating Interdisciplinarity.* Nashville, TN: University of Vanderbilt Press.

Li, G., Long, S., & Simpson, M. E. (1999). Self-perceived gains in critical thinking and communication skills: Are there disciplinary differences? *Research in Higher Education 40* (1), 43-60.

Lincoln, Y., & Guba, E. (1985). *Naturalistic Inquiry*. Beverly Hills, CA: Sage Publications.

Lodahl, J. B., & Gordon, G. (1972). The structure of scientific fields and the functioning of university graduate departments. *American Sociological Review 37* (1), 57-72.

Malaney, G. D. (1986a). Differentiation in graduate education. *Research in Higher Education 25* (1), 82-96.

Malaney, G. D. (1986b). Characteristics of graduate students in Biglan areas of study. *Research in Higher Education 25* (4), 328-341.

Marshall, C., & Rossman, G. B. (1989). *Designing qualitative research.* Thousand Oaks, CA: Sage Publications.

Maxcy, S. J. (2003). Pragmatic threads in mixed methods research in the social sciences: The search for multiple modes of inquiry and the end of the philosophy of formalism. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 51-89). Thousand Oaks, CA: Sage Publications.

Miles, M. B., & Huberman, A. M. (1984). *Qualitative data analysis: A sourcebook for new methods.* Thousand Oaks, CA: Sage Publications.

Morgan, D. L. (2007). Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. *Journal of Mixed Methods Research 1* (1), 48-76.

Morse, J. M. (1991). Approaches to qualitative-quantitative methodological triangulation. *Nursing Research 40* (2), 120-123.

Morse, J. M. (2003). Principles of mixed methods and multimethod research designs. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 189-208). Thousand Oaks, CA: Sage Publications.

Muffo, J. A., & Langston, I. W. (1981). Biglan's dimensions: Are the perceptions empirically based? *Research in Higher Education 15* (2), 141-159.

Neumann, R. (2001). Disciplinary differences and university teaching. *Studies in Higher Education 26* (2), 135-146.

Neumann, Y. (1977). Standards of research publications: Differences between the physical sciences and the social sciences. *Research in Higher Education 7* (4), 355-367.

Neumann, Y., & Boris, S. B. (1978). Paradigm development and leadership style of university department chairpersons. *Research in Higher Education 9* (3), 291-302.

Niglas, K. (2004). The combined use of qualitative and quantitative methods in educational research. *Tallinn Pedagogical University Dissertations in Social Sciences 8.* Tallinn, Estonia: Tallinn Pedagogical University.

Onwuegbuzie, A. J., & Leech, N. L. (2003, November). On becoming a pragmatic researcher: The importance of combining quantitative and qualitative research methodologies. Paper presented at the annual meeting of the Mid-South Educational Research Association, Biloxi, MS.

Onwuegbuzie, A. J., & Leech, N. L. (2005). Taking the "Q" out of research: Teaching research methodology courses without the divide between quantitative and qualitative paradigms. *Quality & Quantity 39* (3), 267-296.

Onwuegbuzie, A. J., & Teddlie, C. (2003). A framework for analyzing data in mixed methods research. . In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 351-383). Thousand Oaks, CA: Sage Publications.

Patton, M. Q. (1988). Paradigms and pragmatism. In D. M. Fetterman (Ed.), *Qualitative approaches to evaluation in education: The silent scientific revolution* (pp. 89-115). New York: Praeger.

Patton, M. Q. (1990). *Qualitative evaluation and research methods* (2nd ed.). Newbury Park, CA: Sage Publications.

Patton, M. Q. (2002). *Qualitative evaluation and research methods* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Paulsen, M, & Wells, C. T. (1998). Domain differences in the epistemological beliefs of college students. *Research in Higher Education 39* (4), 365-384.

Pfeffer, J., Leong, A., & Strehl, K. (1977). Paradigm development and particularism: Journal publication in three scientific disciplines. *Social Forces 55* (4), 938-951.

Pfeffer, J., & Moore, W. L. (1980). Average tenure of academic department heads: The effects of paradigm, size, and departmental demography. *Administrative Science Quarterly 25* (3), 387-406.

Pike, G. R., & Killian, T. S. (2001). Reported gains in student learning: Do academic disciplines make a difference. *Research in Higher Education 42* (4), 429-454.

Ponterotto, J. G. (2005). Qualitative research in counseling psychology: A primer on research paradigms and philosophy of science. *Journal of Counseling Psychology 52* (2), 126-136.

Price, D. J., (1970). Citation measures of hard science, soft science, technology and nonscience. In C.E. Nelson & D. K. Pollock (Eds.), *Communication among scientists and engineers* (pp. 3-22). Lexington, MA: D. C. Health.

Reichardt, C. S., & Cook, T.D. (1979). Beyond qualitative versus quantitative methods. In T. D. Cook & C. S. Reichardt (Eds.), *Qualitative and quantitative methods in evaluation research.* Beverly Hills, CA: Sage.

Reichardt, C. S., & Rallis, S. F. (1994). *The qualitative-quantitative debate: New perspectives.* San Francisco: Jossey-Bass.

Robles, H. J. (1998). *Interdisciplinary courses and programs: Pedagogy and practice. Recommendations for planning, implementation, and evaluation*. Unpublished manuscript.

Ryan, G., and Bernard, H. (2000). Data management and analysis methods. In N.K. Denzin & Y.S. Lincoln (Eds.). *Handbook of qualitative research* (2nd Ed.) (pp. 769-802). Thousand Oaks, CA: Sage Publications.

Schwandt, T. A. (2001). *Dictionary of qualitative inquiry* (2nd ed.). Thousand Oaks, CA: Sage Publications.

Schommer-Akins, M., Duell, O. K., & Barker, S. (2003). Epistemological beliefs across domains using Biglan's classification of academic disciplines. *Research in Higher Education 44* (3), 347-366.

Silver, H. (2003). Does a university have a culture? *Studies in Higher Education 28* (2), 157-169. Silver, H. (2003). Does a university have a culture? *Studies in Higher Education 28* (2), 157-169.

Sinclair, A., & Muffo, J. (2002, June). *The uses of Biglan categories in assessing general education courses.* Paper presented at the annual forum for the Association for Institutional Research, Toronto, Canada.

Smart, J. C., & Elton, C. F. (1975). Goal orientations of academic departments: A test of Biglan's model. *Journal of Applied Psychology 60* (5), 580-588.

Smart, J. C., & Elton, C. F. (1982). Validation of the Biglan model. *Research in Higher Education 17* (3), 213-229.

Smart, J. C., Feldman, K. A., & Ethington, C.A. (2000). *Academic disciplines: Holland's theory and the study of college students and faculty*. Nashville, TN: Vanderbilt University Press.

Smart, J. C., & McLaughlin, G. W. (1978). Reward structures of academic disciplines. *Research in Higher Education 8* (1), 39-55.

Smith, J. K., & Heshusius, L. (1986). Closing down the conversation: The end of the quantiatitve-qualitiative debate among educational researchers. *Educational Researcher 15* (1), 4-12.

Spradley, J. P. (1980). *Participant observation*. New York: Holt, Rinehart, & Winston.

Stage, F. K., & Manning, K. (2003). *Research in the college context.* New York: Brunner-Routledge.

Stoecker, J. L. (1993). The Biglan classification revisited. *Research in Higher Education 34* (4), 451-464.

Storer, N. W. (1967). The hard sciences and the soft: some sociological observations. *Bulletin of the American Medical Association 55* (1), 75-84.

Storer, N. W. (1972). Relations among scientific disciplines. In S. Z. Nagi and R. G. Corwin (Eds.), *The social contexts of research* (pp. 229-268). New York: Wiley.

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques.* Newbury Park, CA: Sage Publications.

Swoboda, W. W. (1979). Disciplines and Interdisciplinarity: A historical perspective. In J. J. Kockelmans (Ed.), *Interdisciplinarity and higher education* (pp 49-92). University Park, PA: The Pennsylvania State University Press.

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches.* Thousand Oaks, CA: Sage Publications.

Tashakkori, A., & Teddlie, C. (Eds.). (2003). *Handbook of mixed methods in social and behavioral research*. Thousand Oaks, CA: Sage Publications.

Teddlie, C., & Reynolds, D. (2001). Countering the critics: Responses to recent criticisms of school effectiveness research. *School Effectiveness and School Improvement 12* (1), 41-82.

Teddlie, C., & Tashakkori, A. (2003). Major issues and controversies in the use of mixed methods in the behavioral and social sciences. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social and behavioral research* (pp. 3-50). Thousand Oaks, CA: Sage Publications.

Teddlie, C., & Tashakkori, A. (2006). A general typology of research designs featuring mixed methods. *Research in the Schools 13* (1), 12-28.

Teddlie, C., & Tashakkori, A. (in press). *Foundations of mixed methods research: Integrating quantitative and qualitative techniques in the social and behavioral science.* Thousand Oaks, CA: Sage Publications.

Teddlie, C., & Yu, F. (2007). Mixed methods sampling: A typology with examples. *Journal of Mixed Methods Research 1* (1).

Thompson, M. E., & Brewster, D. A. (1978). Faculty behavior in low-paradigm versus high-paradigm disciplines: A case study. *Research in Higher Education 8* (2), 169-175.

Tight, M. (2003). The organization of academic knowledge: A comparative perspective. *Higher Education 46* (4) 389-410.

Trowler, P. (1998). *Academics responding to change: New higher education frameworks and academic cultures.* Buckingham, England: SHRE/Open University Press.

Trowler, P., & Knight, P. (1999). Organizational socialization and induction in universities: Reconceptualizing theory and practice. *Higher Education 37* (2), 177-195.

Whitley, R. (1984). *The intellectual and social organization of the sciences.* New York: Oxford University Press.

Whitmire, E. (2002). Disciplinary differences and undergraduates' information-seeking behavior. *Journal of the American Society for Information Science and Technology 53* (8), 631-638.

Wolcott, H. F. (1994). *Transforming qualitative data: Description, analysis, and interpretation.* Thousand Oaks, CA: Sage Publications.

Yoels, W. C. (1974). The structure of scientific fields and the allocation of editorships on scientific journals: Some observations on the politics of knowledge. *Sociological Quarterly 15* (2), 264-276.

You, J-S., & Khagram, S. (2005). A comparative study of inequality and corruption. *American Sociological Review 70* (1), 136-157.

Zuckerman, H., & Merton, R. K. (1971). Patterns of evaluation in science: Institutionalization, structure and functions of the referee system. *Minerva 9* (1), 66-100.

Zuckerman, H., & Merton, R. K. (1972). Age, aging, and age structure in science. In M. W. Riley, M. E. Johnson, & A. Foner (Eds.), *Aging and society* (pp. 292-356). New York: Russel Sage.

APPENDIX: CODE SHEET FOR CONTENT ANALYSIS OF METHODS USED IN RESEARCH ARTICLES

Discipline: _____

Journal Name: _____

Journal Year: _____

Article Citation: _____

Author(s): _____

_____

_____

Title: _____

_____

Type of Article:

Qualitative study _____

Quantitative study _____

Mixed Methodological study _____

Research Design:

Quantitative	***Mixed***	***Qualitative***
Experimental_____	Quasi-Mixed Mono-Strand___	Ethnography _____
*True*_____	Mixed Methods Mulitsrand___	Case Study _____
Quasi _____	*Concurrent Mixed*_____	Narrative _____
Causal Comparative_____	*Sequential Mixed*_____	Phenomenological _____
Correlational _____	*Conversion Mixed*_____	Grounded Theory _____
Survey _____	*Fully Integrated*_____	Critical-Action-Participatory
N/A _____	Quasi-Mixed Multi-Strand_____	N/A _____
	N/A_____	

Paradigm:

Postpositivism / Positivism _____

Pragmatism _____

Critical Theory (transformative-emancipatory) _____

Constructivism (and variants) _____

N/A _____

Sampling Methods:

Probability techniques _____ Mixed techniques _____ Purposeful techniques _____

Type _____ *Type* _____ *Type* _____

Convenience _____ N/A _____

Data Collection Methods:

Test/experimental measure _____

Questionnaire _____

Closed-ended ____ *Open-ended*____

Observation _____

Structured _____ *Unstructured* _____

Interview _____

Standardized-closed _____ *Open-ended* _____

Secondary Data _____

Type _____

N/A _____

Data Types:

Numeric _____ Both _____ Narrative _____ N/A _____

Data Analysis:

Quantitative _____ Mixed _____ Qualitative _____ N/A _____

Type _____ *Type* _____ *Type* _____

VITA

Mark A. Alise has a varied educational background. He studied in diverse institutions of higher education including: St. Mary's Seminary and University (Baltimore, Maryland), The Pontifical Gregorian University (Rome, Italy), The Sorbonne – University of Paris (Paris, France), St. Joseph's Seminary College (Yonkers, New York), and Louisiana State University (Baton Rouge, Louisiana). In 1980 Mark obtained a Bachelor of Science degree with a major in accounting from Louisiana State University. In 1984, while a student at the Pontifical Gregorian University, he was awarded a post-graduate Baccalaureate in Sacred Theology (S.T.B.) degree. Continuing his graduate studies in theology, in 1986 Mark received the Licentiate in Sacred Theology (S.T.L.) degree with a specialization in dogmatic theology, also from the Pontifical Gregorian University. Mark's third post-graduate degree was a Master of Business Administration from Louisiana State University in 1997. Mark is now studying educational leadership and research and anticipates receiving a Doctor of Philosophy degree from Louisiana State University in May of 2008.

Mark's interest in educational research and leadership began after he embarked upon a career in university administration. From 1998 to 2003 he was business manager for the Athletics Department of Louisiana State University. Since 2003 Mark has been the Director of Fiscal Operations at the Pennington Biomedical Research Center, a campus of the Louisiana State University System. After graduation, Mark plans to continue working in university administration while pursuing his research interests.

Mark has also had several adjunct appointments to the faculty of St. Joseph Seminary College (Covington, Louisiana) where he taught several courses in theology, and is currently teaching an introduction to philosophy course.