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The Instructional Perspectives of Community College Mathematics Faculty

Laurie K. McManus
University of Missouri-St. Louis

THE INSTRUCTIONAL PERSPECTIVES OF COMMUNITY COLLEGE MATHEMATICS FACULTY

by

LAURIE K. MCMANUS
B. A., Culver-Stockton College, 1977
M.A., Pittsburg State University, 1980

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Advisory Committee

John A. Henschke, Ed.D.
Chairperson
E. Paulette Isaac-Savage, Ed.D.
Committee Member
Virginia Navarro, Ph.D.
Committee Member
Lloyd Richardson, Ph.D.
Committee Member

Abstract

This study investigated the beliefs, feelings, and behaviors of full-time mathematics faculty at community colleges in a Midwestern state. The online questionnaire for this study included the modified Instructional Perspectives Inventory [IPI] (Henschke, 1989; Stanton, 2005). The subscales of the IPI are: (1) Teacher empathy with learners; (2) Teacher trust of learners; (3) Planning and delivery of instruction; (4) Accommodating learner uniqueness; (5) Teacher insensitivity toward learners; (6) Experience-based learning techniques; and, (7) Teacher-centered learning processes. Approximately 23.4% of invited participants responded to the survey, yielding a sample size of 34.

Statistical analyses included calculations of mean, standard deviation, and standard error for summative subscale scores and summative overall IPI scores. Using a rankings scale proposed by Stanton (2005) ["Low below average", "below average", "average", "above average", "high above average"], all groups for this study were found to be "average" or "below average" in the application of andragogical / adult education principles. Analyses of Variance (ANOVA's) revealed statistically significant differences for subscales one, two, four, five, and for summative overall IPI scores. Using a reliability rating scale suggested by George and Mallery (as cited in Gliem & Gliem, 2003, p. 87), subscales one through six were interpreted as having "good" or "acceptable" internal consistency. Subscale seven was found to have "questionable" consistency for this population.

Recommendations for future research with the IPI include a consideration of the influence of gender, a calculation and interpretation of Cronbach's alpha reliability coefficient and the Spearman-Brown prophecy coefficient, and the inclusion of a

qualitative research component.

Dedication

This work is dedicated to my parents, Patricia and George McManus.

Thanks, Mom

and

Semper Fi, Dad.

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Although I have spent many hours cloistered with my books and writing materials, a work such as this is not completed in isolation. My family, friends, and colleagues have provided support and solace as I have worked for this degree. Rather than leave someone out, you will remain my unsung heroes. Please know that I deeply appreciate all of your love and support.

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Chapter 1: Introduction

Mathematics instruction at the community college is situated in multiple communities of practice; among them the community of adult educators, the community of mathematics educators, and the community college teaching environment. The discourse of the instructor in the mathematics classroom at the community college reflects the expected roles and practices for each of these respective communities.

The role that an adult educator assumes and the subsequent choice of instructional techniques are a consequence of the purpose for instruction. The aims and purposes of adult education have been described in the following ways: to empower learners (Apps, 1989; Brookfield, 1986); to foster self-directed learning (Brookfield, 1986; Galbraith & James, 2004; Grow, 1991); to foster learners' process of critical reflection (Crow, 1980; Galbraith, 1998; Galbraith & James, 2004); and to enhance problem-solving and critical thinking skills (Crow, 1980). Cohen and Brawer (1996) describe instruction as "the process that leads to learning" (p.190).

The instructional process includes the following elements: the teacher (Apps, 1989; Brookfield, 1986; Conti & Kolody, 1998; Heimlich & Norland, 1994; Henschke, 1989b; Kuchinskas, 1979), the learner (Conti, 1985a; Heimlich & Norland, 1994; Heimlich & Norland, 2002), the group (Heimlich & Norland, 1994; Heimlich & Norland, 2002), the content (Conti & Kolody, 1998; Heimlich & Norland, 1994; Heimlich & Norland, 2002), and the environment (Conti, 1985b; Heimlich & Norland, 1994; Heimlich & Norland, 2002). There is a consensus in the literature of adult education regarding the importance of a suitable climate for learning (Brookfield, 1986; Humphrey-Brown & Uhde, 2000; Conti, 1985b; Darkenwald & Valentine, 1986; Dunn & Dunn, 1979; Fenwick, 1996;

Galbraith, 1998; Goldstein & Benassi, 2006; Grasha, 1994; Gregorc, 1979; Darkenwald, 1989; Heimlich & Norland, 2002; Hativa & Birenbaum, 2000; Henschke, 1989b). The teaching style of the adult educator influences the learning environment (Knowles, as cited in Conti, 1985a; Kuchinskas, 1979) and contributes to the emotional climate of the classroom (Grasha, 1994). This is supported by findings by Hativa and Birenbaum (2000). In a study of mathematics learners at an Israeli university, they found that students' perceptions and interpretations of the environment for learning affected their approaches to learning and the subsequent outcomes. Other influences on the learning environment include the personality of the teacher (Apps, 1989; Darkenwald, 1989; Eble, 1980; Galbraith, 1998) and the teachers' cognitive style (Kuchinskas, 1979).

Teaching style is defined as "a pervasive quality that persists even though the content that is being taught may change" (Conti, 1985b, p. 7) and the "operational behavior of a teacher's educational philosophy" (Conti & Wellburn, 1986, p. 20). Teaching style is influenced by educational philosophy, additional academic training, the age of the teacher, and experiential background (Conti, 1985b). Teaching styles develop over time, change slowly, and reflect other characteristics of personality (Conti &Wellburn, 1986). In reporting on the results of a study of the teaching practices of community college faculty members, Grubb (1999) reported consistency in the teaching styles observed.

Teaching style is multidimensional – affects how information is presented, interactions with students, management of classroom tasks, supervision of coursework, how students are socialized to a field of practice, and how students are mentored (Grasha, 1994). Dunn and Dunn (1979) suggest that elements of teaching style include things such as: educational philosophy, student preferences, instructional planning, student

groupings, room design, teaching environment, teaching characteristics, teaching methods, and evaluation techniques. In reporting on responses of college teachers to the question: "What influences your teaching style?", Grasha (1994) listed the most frequent responses:

> the nature of the course (required/not required, major/nonmajor); size of the class; the subject matter (hard sciences vs. humanities); level of the students (freshmen, seniors, graduate); how much they [the teacher] liked the class; time pressure; need to prepare students for standard exams; information about alternative ways to teach; willingness to take risks; and not wanting to deviate from department and college norms for teaching (p. 3).

These statements are consistent with the literature stating that the choice of instructional techniques is influenced by consideration of the elements of the instructional process: the teacher, the learner, the group, the content, and the environment (Conti, 1985b; Conti & Kolody, 1998; Conti & Wellburn, 1986; Galbraith, 1998; Grubb, 1999; Handal, 2003; Miglietti & Strange, 1998; Ross-Gordon, 2002). In addition, these statements lend credence to Prichard's (1995) description of challenges for mathematics educators at the community college in adopting more learner-centered teaching techniques.

Because teaching style is crucial in the education of adults (Coben, D., O'Donoghue, J. & Fitzsimons, G. E., 2000), the assessment of teaching styles is an important step in the development of the professional teacher (Conti, 1985b). The study of teaching style is important to ensure the best experience for teaching and learning (Heimlich & Norland, 2002). Multiple authors have found that a relationship exists between teaching styles and learner achievement (Conti, 1985a; Conti, 1985b; Conti & Wellburn, 1986; Dunn &

Dunn, 1979; Fischer & Fischer, 1979).

A central element of understanding teaching style is congruence between values, beliefs, and behaviors (Brookfield, as cited in Heimlich & Norland, 2002, p. 18). The study of style begins with beliefs, values, attitudes, working philosophy, skills and personality of the educator (Heimlich & Norland, 2002). Several authors address the relationship between teaching style and teaching methods. Heimlich and Norland (2002) distinguish between teaching style and teaching methods. Galbraith (1998) suggests that knowledge of methods is important to the development of teaching style – it provides a rational and systematic perspective for the instructional process. Eble (1980) reminds us that there should be congruence between teaching style and content.

Statement of the Problem

The practice of adult educators is guided by assumptions about adult learners, beliefs about teaching, and theories of teaching (Galbraith, 1985; Grace, 1996; Henschke, 1989b; Holmes, 1980; Knowles, 1968; Knowles et al., 1998; McKenzie, 1985; Phillips, 1981; Pratt, 1993; Rachel, 2002; Suttle, 1982; Zinn, as cited in Galbraith, 1985). A review of both the literature of adult education and the literature of mathematics education finds few studies that specifically address the beliefs, feelings, and behaviors of mathematics faculty at the community college from a perspective informed by the research literature of adult education.

Purpose

This study will investigate the beliefs, feelings, and behaviors of mathematics faculty at the community college, as measured by the Instructional Perspectives Inventory (IPI). In addition, this study will determine reliability of the instrument for this population of

mathematics faculty at the community college. The results of this study will be a descriptive analysis of the beliefs, feelings, and behaviors of mathematics faculty at the community college and a report on the reliability of the IPI for this population.

Research Questions

(1) What are the instructional perspectives of mathematics faculty at the community college?

(a) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by gender?

(b) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by self-identified ethnicity?

(c) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by age?

(d) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by level of education?

(e) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by academic rank?

(f) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is

classified by teaching experience?

(g) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by duration of service as a full-time faculty member at a community college?

(h) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by whether or not members have completed graduate courses in adult education?

(2) Is the IPI a reliable measure for this population?

(3) Does the IPI measure the dimensions it purports to measure?

Delimitations

The population for this study will be full-time mathematics faculty employed at member colleges of the Missouri Association of Community Colleges.

Significance

Multiple authors describe the need for research into the beliefs and practices of community college faculty and mathematics collegiate faculty. Fugate and Amey (2000) report that, while there is an existing body of research regarding the characteristics of community college faculty, little research exists that might provide insights into the teaching practices of community college faculty. Grubb (1999) cites a lack of empirical investigations of teaching at the community college. Fang (1996) describes how researchers have become increasingly interested in teacher thinking. Sztajn (2001) suggests that knowledge of beliefs that mathematics teachers have that are not directly related to mathematics education could help to "integrate beliefs and practice" (p. 2).

Smith, Spear, and Horvath (2007) describe a lack of descriptive empirical research on the practice of collegiate mathematics faculty.

The design of this study is consistent with the educational research literature. In a review of submissions to the *Adult Education Quarterly*, Taylor (2001) found that teaching/curriculum were among the major topics of interest of submissions to this journal for the time period dated 1989 to 1999. In a review of research methods reported in the *American Educational Research Journal*, the *Educational Researcher*, and the *Review of Educational Research* for the years from 1978 to 1997, Elmore and Woehlke (1998) found descriptive research to be among the top-ranked methods. This study will provide a descriptive analysis of the instructional perspectives of mathematics faculty at the community college in terms of the principles of practice for adult educators. By its nature - the use of an instrument that measures beliefs, feelings, and behaviors of adult educators with a population of mathematics faculty from the community college - this study will contribute to the empirical base of the research literature of adult education and may help to bridge the research gap that exists between mathematics education and adult education.

The reliability of the Instructional Perspectives Inventory (IPI) has been analyzed in two previous studies: Thomas (1995) analyzed reliability of the instrument with a population of parent educators; Stanton (2005) analyzed reliability of the instrument with a population of adult educators from diverse backgrounds. The instrument will be analyzed for reliability with a population of community college mathematics educators. The determination of reliability will enhance the utility of this instrument for future research studies about adult educators' beliefs, feelings, and behaviors.

Definitions of Terms

Andragogy	Andragogy is "the art and science of helping adults to learn" (Knowles, 1968, p. 351).
Behaviors	Behaviors are "the actions of the teacher in conducting classroom activities" (Henschke, 1989b, p. 83).
Beliefs	"Pre- or inservice teachers' implicit assumptions about students, learning, classrooms, and the subject matter to be taught" (Kagan, 1992, p. 66).
Community of Practice	"Communities of practice are groups of people who come together informally to share expertise, learn, and practice" (Merriam, Courtenay, & Baumgartner, 2003, p. 171).
Discourse	"Ways of speaking, thinking, and acting" (Chapman, 2005, p. 171). "The means by which a group actively shapes and orders their relationship to the social world. In so doing, they also establish boundaries that further define authority, membership, identity, and legitimacy in a community of practice" (Pratt & Nesbit, 2000, p. 118).
Feelings	"Emotional perspectives of the teacher towards the students" (Dawson, 1997, p. 5).
Instructional Perspectives	"Guiding beliefs, feelings, and behaviors theorized and practiced by adult educators" (Stanton, 2005, p. 21).
Instructional Practices	"Faculty behaviors that help students learn" (Schuetz, p. 40). For this study, instructional practices and teaching

practices will be synonymous.

Learner-centered — In a learner-centered approach,

> the instructor is more a guide to students as they create their own knowledge, relying on expertise from a variety of sources; the authority for interpreting a text is more likely to be shared between the instructor and the student. (Grubb, 1999, p. 33)

Multicultural Perspective — "An educational process that promotes an understanding and appreciation of the cultural diversity within a pluralistic society" (as cited in Burstein, 1997, p. 524). A multicultural perspective and a sociocultural perspective are sometimes confused in the literature.

Reliability — "The consistency of a measurement procedure" (Furlong et al., 2000, p. G15).

Sociocultural Perspective — From a sociocultural perspective, knowledge is rooted in participation in communities of practice (Cobb & Yackel, 1996). In a discussion of a sociocultural discourse, Pratt & Nesbit (2000), state that

> Learning [is] assumed to start at an unconscious level as people interact, socially, within a community of practice or social network of relations. As they [appropriate] the actions and

> ways of relating within the social group, they would also take on the goals and perspectives of members of that community or group. Membership and participation would then shape how people think, value, and act in relation to the work and other members of that community. (p. 121)

Teaching Experience	The number of years that a person has served as a classroom teacher.
Teaching Practices	For this study, teaching practices will be synonymous with instructional practices.
Validity	"The extent to which an instrument or a research design does what it is supposed to do" (Furlong, N., Lovelace, E., & Lovelace, K., 2000, p. G19).

Organization of the Study

In Chapter one, this study has been introduced with a discussion of the elements of the instructional process and the importance of integrating beliefs with practice. Chapter two will provide a review of the research literature of adult education and mathematics education. The discourse of teachers of adults, a sociocultural perspective on adult education, and the community college will be discussed. In addition, a sociocultural perspective on mathematics education will be introduced. Chapter three will introduce the methodology for this study. A report of the findings from this study is provided in Chapter four. Chapter five provides a summary and discussion of the findings from this study.

Chapter 2: Review of Literature

Mathematics instruction at the community college is situated at the confluence of adult education and mathematics education. This chapter provides a review of the literature of adult education pertaining to the discourse of teachers of adults, a sociocultural perspective on adult education, and the community college. In addition, a review of the literature of mathematics education providing a sociocultural perspective on mathematics education is discussed.

The Discourse of Teachers of Adults

The discourse of teachers of adults includes a perception of their roles, andragogical orientation, and teaching practices. The following sections will provide a description of the metaphors for adult educators and the roles of adult educators, andragogical and pedagogical beliefs and practices, and the teaching practices of teachers of adults.

Teachers of Adults – Metaphors and Roles

The literature of adult education uses metaphors to describe the teaching of adults. For example, Apps (1989) offers metaphors of "lamplighter, gardener, muscle builder, bucket filler, travel guide, and factory supervisor" (p. 24). In a study of adult-educators-in-training, Fenwick (1996) reported that participants' metaphors for themselves could be summarized as "guide, fire starter, outfitter, caregiver, dispenser, and good host" (p. 3). The metaphor of guide (Apps, 1989; Fenwick, 1996; Galbraith, 1998; Grubb, 1999; Hativa & Birenbaum, 2000; Henschke, 1989a) is a recurrent theme in the adult education literature, as is a reference to the adult educator as mentor (Bourdon & Carducci, 2002; Galbraith, 1998; Galbraith & James, 2004; Imel, 1999). Conti (1985a) and Brookfield (1986) refer to adult educators as facilitators of learning.

Teachers of adults assume many roles. Galbraith (1998) proposes the following roles for an effective teacher of adults: "role model, mentor, counselor, content resource person, learning guide, instructional developer, institutional representative" (p. 5). Teachers of adults have been described as assuming the roles of "curriculum developer, researcher, lecturer, discussion leader, assessor" (Bess, as cited in Galbraith & James, 2004, p. 680) and "transmitters of information" (Crow, 1980, p. 43). In a review of the literature of adult education, Imel (1999) found the following descriptions of the roles of adult educators: "teacher, instructor, helper, facilitator, consultant, broker, change agent, and mentor" (p. 3). As educators of adults, we aim to foster lifelong learners; we are reminded in the literature that effective teachers of adults accept the role of lifelong learner (Ellis & Berry, 2005; Heimlich & Norland, 2002; Ross-Gordon, 2002).

Andragogical Orientation of Faculty

In an address in 1968, Malcolm Knowles suggested the term "andragogy" to describe the work of adult education (Knowles, 1968). Knowles's model of andragogy has contributed to our understanding of adults as learners (Bedi, 2004; Grace, 1996; Pratt, 1993; Stickney-Taylor & Sasse, 1990). The model includes assumptions about the need to know, the learners' self-concept, the role of the learner's experience, readiness to learn, orientation to learning, and motivation for engaging in the learning process (Knowles, Holton, & Swanson, 1998). In his 1968 speech Knowles offered several implications of his proposed andragogical model for the adult education experience: the importance of the learning climate, the engagement of the adult in the diagnosis of his or her own learning needs, and the involvement of participants in planning what they will learn and how they will learn it (Knowles, 1968).

The andragogical model of learning is viewed as a learner-centered model (Bedi, 2004) and one that is problem-centered (Delahaye, B. L., Limerick, D. C. & Hearn, G., 1994). The pedagogical model of learning is viewed as a subject-centered model (Delahaye et al., 1994) and a teacher-centered model (Bedi, 2004). When an andragogical philosophy is applied to the learning experience, the learning climate is characterized as one of mutual respect and informality (Davenport & Davenport, 1985b). The nature of the learning process is collaborative: diagnosis of needs, planning, formulation of objectives, and evaluation are a mutual process (Davenport & Davenport, 1985b). When a pedagogical philosophy is applied to the learning experience, the instructor is responsible for diagnosis of learning needs, planning, formulation of objectives, and evaluation (Davenport & Davenport, 1985b). Bedi (2004) suggests that a pedagogical approach would be to give the answer to a question; an andragogical approach would be to facilitate the learner's finding of the answer to the question. Merriam (2001) suggests that andragogical principles may serve as a guide to practice.

The application of "andragogy" and "pedagogy" are situational - andragogical and pedagogical approaches to learning are appropriate at different times and for different purposes (Brookfield, 1986; Carlson, 1980; Davenport, 1987; Holmes, 1980; Knowles, 1980; McKenzie, 1985; Merriam, 2001; Pratt, 1988; Rachel, 2002). A foundational assumption of andragogy is that the learner is self-directed (Brookfield, 1986), and that the learning experience can be negotiated. Pratt (1993) suggests that the negotiation of learning objectives and evaluation of learning may not be appropriate for particular content areas. "Pedagogical relationships … are appropriate when learners are dependent on the teacher for direction. Andragogical relationships … are appropriate when learners

can be somewhat self-directing" (p. 167). Knowles (1980) provides this caveat: "an ideological pedagog would want to keep me dependent on a teacher, whereas a true andragog would want to do everything possible to … encourage me to take increasing initiative in the process of further inquiry" (p. 53).

The notion that andragogical and pedagogical practices are situationally appropriate has led to multiple perspectives on the relationship between andragogy and pedagogy: andragogy and pedagogy arranged on a continuum (Cross, 1981; Davenport & Davenport, 1985b; Delahaye et al., 1994; Knowles, 1980; McKenzie, 1985; Rachel, 1983); andragogy and pedagogy as dichotomous (Carlson, 1980; Cross, 1981); and andragogy and pedagogy as having an orthogonal relationship (Delahaye et al., 1994). In contrast to these multiple perspectives, Elias (1979) argues that there is no basis for a distinction between andragogy and pedagogy.

The adoption of andragogical principles and practices or the adoption of pedagogical principles and practices must be given careful consideration. Rachel (1988) provides a note of caution regarding andragogical and pedagogical orientations: "a disquieting number of adult educators and adult education students do see pedagogy as highly rigid, regressive and non-conducive to learning, while andragogy is [perceived as] flexible, progressive, and inevitably conducive to learning" (p. 15). In a paper urging critical reflection on learner-centered approaches to adult education, Edwards (1991) suggests not only that learner-centered practices in adult education may be based on the notion that adult learners' needs are different, but also that learner-centered practices may be a way to "mask and mystify learning processes and experiences in which the needs of learners are secondary to other needs – of institutions, government, customers, professional

groups, and so on" (p. 286). Edwards further suggests that discourses on the needs of adult learners may be based on different concepts of ways to meet the needs of the learner.

The literature supports the need for adult educators to reflect critically on their practice and the beliefs that inform their practice (Apps, 1989; Bourdon & Carducci, 2002; Brookfield, 1986; Brown & Smith, 1997; Conti, 1985a; Conti, 1985b; Conti & Kolody, 1998; Conti & Wellburn, 1986; Crow, 1980; Fuhrman & Grasha, 1983; Galbraith, 1998; Heimlich & Norland, 1994; Heimlich & Norland, 2002; Henschke, 1989a; Holmes, 1980; McKenzie, 1977; Phillips, 1981; Pratt, 1993; Pratt, 2002; Pratt, 2005; Rachel et al., 1993; Ross-Gordon, 2002; Suttle, 1982; Zinn, as cited in Galbraith, 1985). Andragogy has contributed to our understanding of adults as learners (Bedi, 2004; Grace, 1996; Henschke, 1989a; Pratt, 1993; Stickney-Taylor & Sasse, 1990) and provided a lens through which to view our practice as adult educators (Pratt, 1993). Attending to the question of educational orientation provides adult educators with an opportunity to reflect critically on their practice. It is through this critical reflection that reasoned choices about the practice of educating adult learners can be made.

Teaching Practices of Adult Educators

In the literature of adult education, teaching practices are sometimes described as teacher-centered (Beder & Darkenwald, 1982; Bedi, 2004; Grubb, 1999; Kember, 1997) or learner-centered (Beder & Darkenwald, 1982; Bedi, 2004; Grubb, 1999; Kember, 1997). Kember (1997) characterizes teacher-centered practices as having a focus on the mastery of content and learner-centered practices as having a focus on the conceptualization of knowledge. Grubb (1999) presents the teacher-centered approach in

terms of behaviorism, and the learner-centered approach in terms of constructivism. He associates the "extrinsic rewards and punishment of grades, teacher approval, and future consequences" (p. 28) with the teacher-centered approach. He depicts the learner-centered approach as "meaning making" (p. 31), with the instructor as a guide and a shared authority for interpretation.

It is consistently reported in the literature that the appropriateness and effectiveness of particular instructional techniques is situational (Brookfield, 1986; Brookfield, 1992; Conti, 1985a; Conti, 1985b; Conti & Wellburn, 1986; Darkenwald, 1989; Merril, 2001). Beder and Darkenwald (1982) conducted a study of teachers of pre-adults and adults in both secondary and postsecondary institutional settings. From this study, they concluded that:

> the real issue is not whether learner-centered methods are universally applied by teachers of adults, but rather for what purposes and under what conditions such methods, and others, are most appropriate and effective and in fact used by teachers. (p. 153)

Conti (1985a) found that GED students learned more in a teacher-centered environment, while Humphrey-Brown and Uhde (2000) found that the application of techniques from adult education enhanced students' development of self-confidence and understanding of mathematical concepts. Kerwin (1981) describes how the use of performance contracts in a course at a community college resulted in increased student involvement.

A teaching technique commonly associated with a teacher-centered approach is the lecture. Contrasting views on the effectiveness of the lecture technique may be found in the literature. Merril (2001) found that learners perceived the lecture technique as

providing a framework for their learning. Grasha (1994) contends that the lecture technique facilitates factual learning. Grubb (1999) reports that community college faculty members working with low-achieving students perceive whole-class lecture as an ineffective instructional technique. He describes a form of lecture combined with discussion or a workshop as "hybrid practices [that allow for] teacher dominated presentation of knowledge and skills [and] time for student interpretation and practice" (p. 28).

A common topic of discussion in the literature is the issue of participatory learning and student engagement. Endorf and McNeff (1991) conducted a study of adult learners in a weekend college program. They identified five types of learners and suggest instructional practices to address the needs of each type. Each of the five instructional strategies suggested incorporates degrees of student participation. Grubb (1999) addresses how patterns of questions and interactions established by the instructor determine levels of student engagement and student learning. Bourdon and Carducci (2002) suggest increasing the frequency of meaningful interactions with students as an effective means to improve teaching. Both Brookfield (1986) and Ediger (1999) describe how participatory learning engages learners.

The American Mathematical Association of Two-Year Colleges (AMATYC), the professional organization for two-year college mathematics educators, has proposed a set of standards for teaching mathematics at the two-year college. These standards were published in 1995 and propose reforms in mathematics education at the two-year college that are consistent with the philosophies and practices of adult education.

The Standards for Pedagogy recommend the use of instructional strategies that

> provide for student activity and interaction and for student-constructed knowledge [including] teaching with technology, interactive and collaborative learning, connecting with other experiences, multiple approaches, and experiencing mathematics (AMATYC, 1995, preface).

There is a growing body of literature in mathematics education and adult education reporting on classroom practices incorporating these standards. It may be inferred from this body of literature that the pedagogy of the mathematics curriculum at the community college is in transition from a state of teacher-centered practices to a state of learner-centered practices.

Summary

The discourse of teachers of adults includes a perception of their roles, andragogical orientation, and teaching practices. Multiple authors offer metaphors and descriptions for the roles that adult educators assume (Apps, 1989; Bess, as cited in Galbraith & James, 2004; Brookfield, 1986; Bourdon & Carducci, 2002; Conti, 1985a; Crow, 1980; Ellis & Berry, 2005; Fenwick, 1996; Galbraith, 1998; Galbraith & James, 2004; Grubb, 1999; Hativa & Birenbaum, 2000; Heimlich & Norland, 2002; Henschke, 1989a; Imel, 1999; Ross-Gordon, 2002). An andragogical orientation may be perceived as learner-centered (Bedi, 2004); the pedagogical model of learning may be viewed as subject-centered (Delahaye et al., 1994) and teacher-centered (Bedi, 2004). The application of andragogical and pedagogical principles is situational (Brookfield, 1986; Carlson, 1980; Davenport, 1987; Holmes, 1980; Knowles, 1980; McKenzie, 1985; Merriam, 2001; Pratt, 1988; Rachel, 2002). In the literature of adult education, teaching practices are sometimes described as teacher-centered (Beder & Darkenwald, 1982; Bedi, 2004;

Grubb, 1999; Kember, 1997) or learner-centered (Beder & Darkenwald, 1982; Bedi, 2004; Grubb, 1999; Kember, 1997).

A Sociocultural Perspective on Adult Education

Relatively few sources directly describing a sociocultural perspective on adult education may be found in the literature. Bonk and Kim (1998) cite the cross-disciplinary nature of the sociocultural perspective and consequent research as a challenge to the impact of sociocultural theory on adult education. The following sections will introduce the reader to discourses on teaching and learning in adult education, including the sociocultural perspective. In addition, the social nature of learning, the use of tools and signs, and relationships of power are addressed.

Discourses on Teaching and Learning

Pratt and Nesbit (2000) name five discourses on the nature of teaching and learning in adult education: a discourse of behaviorism, a discourse of andragogy, a cognitive learning discourse, a constructivist discourse, and a sociocultural discourse. In the discourse of behaviorism, "Learning is defined as a change in behavior" (p. 119). Content is emphasized, and knowledge is described in terms of learning objectives and their corresponding outcomes. In an andragogical discourse, as previously discussed in this review of the literature of adult education, the learner's experience and participation are accorded precedence over content. Significant to the discourse of andragogy is the assumption of the readiness of the learner for self-directed learning. The metaphor of a computer – storage and retrieval of information, processing of information, and memory components - is central to the cognitive learning discourse. Within a cognitive learning discourse, as in the behaviorist discourse, learning is assessed against pre-specified

outcomes. Within the constructivist discourse on teaching and learning, "teaching ... is concerned with qualitative, rather than quantitative, changes in thinking and valuing" (Marton & Booth, as cited in Pratt & Nesbitt, 2000, p. 121).

An emergent discourse on the learning and teaching of adults is the sociocultural discourse. Within this discourse, teaching and learning are social in nature, occurring within communities of practice (Alfred, 2002b; Bonk & Kim, 1998; Pratt & Nesbitt, 2000). Alfred (2002a) suggests that a sociocultural perspective on adult education is promising because it "opens a discursive space for acknowledging and supporting multiple ways of knowing" (p. 12). Bonk and Kim (1998) describe the sociocultural perspective on adult education as "inviting and informative" (p. 67). They further cite three major challenges for the impact of sociocultural theory on adult education: a lack of research and scholarly work directly linking sociocultural theory and adult learning; a current research focus on sociocultural practices in K-12 education; and the cross-disciplinary nature of the sociocultural perspective and consequent research.

Learning as Participation in Communities of Practice

From a sociocultural perspective, knowledge is constituted within communities of practice (Bonk & Kim, 1998). Learning is mediated by experiences within a community (Hansman, 2001) and is rooted in learners' participation in communities of practice (Jacobson, 1996). Lave and Wenger (as cited in Jacobson, 1996, p. 6) describe learning as a process by which newcomers become part of a community of practice. In the study of a (Wiccan) community of practice, Merriam et al. (2003) described their findings as having "illuminated the interrelationship of participation, practice, learning and identity" (p. 187).

Learning is social in nature (Brown, Collins, & Duguid, 1989; Hansman, 2001; Hansman & Wilson, 2002; Lave, 1996; Merriam et al., 2003; Pekarek Doehler, 2002; Pratt & Nesbitt, 2000; Wilson, 1993). Schon (as cited in Jacobson, 1996, p. 7) describes learning as negotiated meaning. For Edwards (1991), learning is not only the mastering of content, but also an assignment of meaning to ourselves and to the world. Jacobson (1996) suggests that meaning is negotiated within communities of practice. The classroom may be viewed as a community of practice (Merriam et al., 2003). Meaning is mediated in the classroom through social interactions between the teacher and the students and among students (Grubb, 1999; Wertsch, 1991).

Cognitive development occurs within a community of practice (Pekarek Doehler, 2002). In a study of how ordinary classroom experiences impact college students' critical thinking, Tsui (1999) found that classroom experiences are significant to students' development of cognitive skills. In a study of how adult undergraduate students construct and negotiate their learning in the undergraduate classroom, Kasworm (2003) found, "The adult undergraduate students believed the classroom was the main stage for the creation and negotiation of the meanings of collegiate learning, of being a student, and for defining the collegiate experience and its impact" (p. 84).

The Use of Tools and Signs

From a sociocultural perspective, learning is mediated through the use of tools and signs (Wertsch, 1991). The meaning of tools is negotiated within a community of practice (Brown et al., 1989). Knowledge in an adult education setting is constituted through the use of situationally appropriate tools and signs (Brown et al., 1989; Hansman, 2001; Hansman & Wilson, 1998; Pekarek Doehler, 2002; Wilson, 1993). Tools and

signs described in the literature of adult education include: computers and software (Bonk & Kim, 1998; Hansman, 2001; Wilson, 1993); maps (Bonk & Kim, 1998; Wilson, 1993); and written language (Bonk & Kim, 1998; Hansman, 2001). Hansman (2001) distinguishes between technical tools such as computers and calculators and psychological tools such as "language, counting, writing, and strategies for learning" (p. 45). Brown et al. (1989) include algorithms, routines, and definitions in their description of tools and signs for adult education.

Adult learning is influenced by the use of tools and signs. Hansman and Wilson (1998) describe how tools and activities can influence the teaching of writing to adults. Brown et al. (1989) discuss the relationship between tools and knowledge – and the influence of both on the users world view and belief systems. Bonk and Kim (1998) propose that "The invention of portable computers, fax machines, cellular phones, and other cultural tools ... creates additional opportunities for social interaction and learning within higher education and other learning institutions" (p. 75), and that "distance education programs and the World Wide Web (WWW) will significantly alter the educational opportunities of those in rural and Third World settings and the overall market for adult education" (p. 75).

Relationships and Power

The social nature of teaching and learning positions participants in relationships of power (Bedi, 2004; Brookfield, 1995; Cafferella & Merriam, 1989; Colin & Heaney, 2001; Edwards, 1991; Hansman & Wilson, 1998; Hansman & Wilson, 2002; Jacobson, 1996; Jarvis, 1997; Johnson-Bailey et al., 1997; Sanguinetti, J., Waterhouse, P., & Maunders, D., 2005). Cafferella and Merriam (1989) suggest that "issues of knowledge

and power become legitimate aspects of adult learning" (p. 64) when learning and knowing are assumed to be a cultural phenomenon. Brookfield (1986) states that the nature of the teaching and learning transaction is determined by "the extent to which mutual respect, negotiation, collaborativeness, and praxis are present" (p. 9). Bedi (2004) contends that the notions of pedagogy and andragogy allow us to acknowledge the potential power relationships inherent in teaching and learning transactions. For Lave (1996), the transmission model of cognition implicitly privileges the transmitter's point of view.

In discussing the potential for teacher domination of learners, Jarvis (1997) describes three dimensions of power - coercive power, covert power, and social power – and four dimensions of authority – rational/legal authority, traditional authority, charismatic authority, and professional authority. Jarvis provides examples for each of the three dimensions of power. For coercive power, how adult learners are expected to conduct themselves in the adult education classroom is discussed. The omission or inclusion of particular lesson topics exemplifies the exercise of covert power. Acceptance of and conformity to a social system is characterized as social power. Rational/legal authority is embedded in the function of the teacher – teachers have this authority "because of their relationship to the school, college, or university which employs them and only in relation to duties that they carry out in respect to that role" (p. 86). Traditional authority rests upon the societal significance of the teacher. Charismatic authority is associated with the "superb lecturer" (p. 86). Professional authority is associated with a perception of the expertise of the teacher.

Sanguinetti, Waterhouse, and Maunders (2005) describe five elements constituting

"The Teacher in Adult and Community Education" that emerged from a participatory action research study conducted with practitioners in adult and community education. The elements include: "personal engagement with learners; self-reflection on one's teaching and one's own learning journey; improvisation and risk-taking; awareness of relations of power; and having patience and trust in the learning process" (p. 271). Power is characterized as institutional - grading power - and personal - stemming from status, personality, professional knowledge, and life knowledge. The institutional classroom evolves into a learning community by the diffusion of institutional and personal power and the development of a model of "power with" (p. 282) rather than "power over" (p. 282).

Colin and Heaney (2001) provide a description of the negotiation of power in a graduate program, describing three components of the democratic structure of a graduate classroom as the student governance group, the teaching faculty, and the doctoral steering committee. Resolving conflicts of interest among and between them is described as a "messy" (p. 34) process requiring negotiation and compromise.

Although the nature of power within a discourse community may be constraining, it may also be enabling (Edwards, 1991). Jarvis (1997) suggests that it is the responsibility of teachers to "use the power inherent in their position to demonstrate concern for their students in the teaching and learning relationship" (p. 89). Pekarek Doehler (2002) found that mutual construction and mutual regulation of classroom activities resulted in a shared responsibility for learning. Alfred (2002b) states that although a discourse community can be a site for power and domination, it can also foster the opportunity to change culture and values.

Summary

An emergent discourse on the learning and teaching of adults is the sociocultural discourse. Within this discourse, the social nature of learning, the use of tools and signs, and relationships of power are considered. From a sociocultural perspective, learning is mediated, meaning is negotiated, and cognitive development occurs within a community of practice (Alfred, 2002b; Bonk & Kim, 1998; Brown et al., 1989; Grubb, 1999; Hansman, 2001; Hansman & Wilson, 2002; Jacobson, 1996; Kasworm, 2003; Lave, 1996; Lave & Wenger, as cited in Jacobson, 1996; Merriam et al., 2003; Pekarek Doshler, 2002; Pratt & Nesbitt, 2000; Schon, as cited in Jacobson, 1996; Tsui, 1999; Wertsch, 1991; Wilson, 1993). Adult learning is influenced by tools and signs, which include computers and software, written language, and algorithms, routines, and definitions (Bonk & Kim, 1998; Brown et al., 1989; Hansman, 2001; Hansman & Wilson, 1998; Pekarek Doehler, 2002; Wilson, 1993). Multiple authors address how the social nature of teaching and learning position participants in relationships of power (Alfred, 2002b; Bedi, 2004; Brookfield, 1995; Cafferella & Merriam, 1989; Colin & Heaney, 2001; Edwards, 1991; Hansman & Wilson, 1998; Hansman & Wilson, 2002; Jacobson, 1996; Jarvis, 1997; Johnson-Bailey et al., 1997; Lave, 1996; Pekarek Doehler, 2002; Sanguinetti, J., Waterhouse, P., & Maunders, D., 2005).

A Sociocultural Perspective on Mathematics Education

The following sections provide a review of the literature of mathematics education from a sociocultural perspective. The reader will be introduced to perspectives on the nature of knowledge, a view of mathematics as a culture, and the mathematics classroom viewed as a community of practice.

Perspectives on the Nature of Knowledge

Four perspectives on the nature of knowledge can be found in the literature regarding mathematics education. These perspectives are the behaviorist, the constructivist, the sociocultural, and an emergent perspective that integrates the constructivist with the sociocultural. The difference in these perspectives is "in the assumptions about knowledge: its source, how one obtains access to it, and the nature of its transmission in the teaching-learning relationship" (Stodolsky, 1985, p. 125).

From the behaviorist perspective, knowledge is acquired through imitative behavior. From the constructivist perspective, knowledge is the development of cognitive restructurings. From the sociocultural perspective, knowledge is rooted in participation in communities of practice. The emergent perspective coordinates the constructivist and the sociocultural positions on the nature of knowledge (Cobb & Yackel, 1996).

There are many contrasts between the constructivist and the sociocultural perspectives on knowledge: acquisition versus participation (Kieran, C., Forman, E., & Sfard, A., 2001); mathematical meaning that is imposed versus mathematical meaning that is negotiated (Cobb, 1988); the role of teachers and students (Cobb, 1988; Cobb, 1994; Forman & Ansell, 2002; Greeno, 1997; vanOers, 2001; vanOers 2002; Sfard, 2001) and relationships of power (Lerman, 2001; vanOers, 2001). This review of the research literature on mathematics education will integrate some of the contrasts between perspectives on knowledge with a discussion of the culture of mathematics education and communities of mathematical practice.

Acquisition versus Participation

When learning is conceptualized as the storage of information, the metaphor of

learning by acquisition may be adopted. "Acquisition [takes] place either by passive reception or by active construction, resulting in a personalized version of concepts and procedures" (Sfard, 2001, p. 21). "For participationists, learning is first and foremost about the development of ways in which an individual participates in well-established communal activities" (Sfard, 2001, p. 23). The dichotomy of acquisition versus participation "rests on differing visions of the mechanism of learning" (Sfard, 2001, p. 23). The acquisitionist views learning as an individual activity; for the participationist, the focus is on the participation in the practice of mathematics (Kieran et al., 2001; vanOers, 2001; Sfard, 2001).

The Making of Mathematical Meaning

From a sociocultural perspective, meaning is mediated through social interactions between the teacher and the student and among students.

> In the mathematics classroom, interactions should not be seen as windows on the mind but as discursive contributions that may pull others forward into their increasing participation in mathematical speaking/thinking, in their zones of proximal development. Vygotsky's zone of proximal development is both a framework for the analysis of learning and a metaphor for the learning interaction. (Lerman, 2001, p. 89)

The development of mathematical meaning may be seen as meaning imposed by the teacher or as meaning negotiated through the discourse of the mathematics classroom community (Cobb, 1988).

The Role of Teachers and Students

The development of students' identities "as speakers and actors of mathematics in

school classrooms" (Lerman, 2001, p. 98) is influenced by the previous experiences of the students, the ways in which the teacher frames mathematical activities in the classroom, the texts, and the social practices of the classroom community (Lerman, 2001; Marr, 2000). Students may be viewed as passive learners who receive knowledge transmitted by the teacher or as active participants in a mathematical discourse (Cobb, 1994; Cobb, 2002; Kieran et al., 2001; Lerman, 2001; Marr, 2000; vanOers, 2001; vanOers, 2002; Sfard, 2002; Sfard & McClain, 2002; Stodolsky, 1985). Teachers may be viewed as guardians of content (vanOers, 2002) and as guides (vanOers, 2001) for the practice of mathematics. The actions of the teacher will constrain the nature of the learning (Cobb, 1988).

Relationships and Power

The structure of a discourse positions people in practices as powerful or as powerless (Lerman, 2001). In the mathematics classroom, students may perceive the teacher and the text as the "authorities" in terms of what is mathematically appropriate, particularly in terms of whether or not an answer is correct. Students may perceive the interventions of teachers as demands rather than as suggestions (Cobb, 1988). The style and the course of the discursive process will be determined by "the authority and power relationships that are involved" (vanOers, 2001, p. 60).

The Culture of Mathematics

The use of signs, tools, and language play an integral part in the acquisition of mathematical concepts. The study of mathematics can be likened to initiation and acceptance into a culture (Lerman, 2001; vanOers, 2001; Sfard, 2001; Sfard & McClain, 2002).

> Culture has several distinguishing characteristics. (1) It is based on *symbols*—abstract ways of referring to and understanding ideas, objects, feelings, or behaviors—and the ability to communicate with symbols using language. (2) Culture is shared. People in the same society share common behaviors and ways of thinking through culture. (3) Culture is learned. While people biologically inherit many physical traits and behavioral instincts, culture is socially inherited. A person must learn culture from other people in a society. (4) Culture is adaptive. People use culture to flexibly and quickly adjust to changes in the world around them. (Encarta, 2004)

The culture of mathematics is the culture of numeracy. While this culture shares some signs, tools, and language with other cultures, there are representations and interpretations specific to the culture. All are essential to the development of mathematical concepts. The development of mathematical concepts is a social as well as an individual endeavor (Cobb, 1994; Cobb & Yackel, 1996; Cobb, 2002; Marr, 2000; vanOers, 2001).

The Use of Tools and Language

In the culture of mathematics, there are conventions for the use of language, symbols, representations (Greeno & Hall, 1997), tools (Cobb, 2002; vanOers, 2002; Sfard & McClain, 2002), and inscriptions (Forman & Ansell, 2002; Lerman, 2001; Sfard & McClain, 2002). There are social norms (Cobb &Yackel, 1996) for what constitutes mathematical activity. There is a rich history associated with the use of language and tools for the study of mathematics (vanOers, 2001).

Knowledge of mathematics and understanding of mathematics are mediated through

the use of the tools of mathematics (Lerman, 2001; vanOers, 2002; Sfard , 2001; Sfard, 2002; Sfard & McClain, 2002). The tools of mathematics are not only devices which may be manipulated – e.g., the calculator, the compass, the protractor – but also the language and inscriptions of mathematics. An inscription is

> a term that we use to include drawings, maps, diagrams, text, recordings from instruments, mathematical formalisms of various kinds, and even physical models, [that] serve to preserve, compose, and make public parts of the world so that they can be subjected to argument, they can be progressively built up and elaborated upon, and their history can be captured and preserved. (Lehrer et al., as cited in Sfard & McClain, 2002, p. 154)

The meanings associated with the use of tools adapt as the study of mathematics evolves.

Communities of Practice – The Classroom Community

It is within communities of practice that students are socialized to mathematical content (Cobb, 2002), to notions of what constitutes mathematical activity (Cobb, 2002; VanOers, 2001), and to sociomathematical norms (Cobb & Yackel, 1996). Students learn legitimate ways to use the language, symbols, representations, tools and inscriptions associated with the practice of mathematics. Students learn the meta-discursive rules (vanOers, 2001; Sfard, 2001) that regulate communication in the practice of mathematics. "It is within the system of meta-rules that people's culturally-specific norms, values and beliefs are encoded" (Sfard, 2001, p. 30).

Knowledge and understanding of mathematical content evolve through participation in the discourse of mathematics (Cobb, 2002; vanOers, 2001). The development of capacities for mathematical reasoning is constituted within classroom interactions (Cobb,

2002; vanOers, 2002). The practice of mathematics may be perceived as being regulated by sociomathematical norms (Cobb & Yackel, 1996). It is through participation in meaningful mathematical activities that students are socialized to the practice of mathematics (Forman & Ansell, 2002).

The Role of the Teacher

The role of the teacher of mathematics is to guard the content (vanOers, 2002), to represent the cultural history of mathematics (vanOers, 2001), and to facilitate cognitive restructuring and conceptual reorganizations (Cobb, 1988). The training of future teachers of mathematics is grounded in knowledge and understanding of mathematics. Teachers complete an agreed-upon set of mathematics courses in preparation for their respective teaching levels. The teacher is expected to contribute to the classroom forum not only knowledge of educational techniques, but also an understanding and interpretation of the language, symbols, representations, tools and inscriptions associated with the practice of mathematics (Schoenfeld, 1992). Teachers are expected to attend to the mathematics curriculum for their school.

The teacher functions as a mediator of mathematical meanings (Cobb, 1994). As Lerman (2001) argues:

> [Students are] developing identities ... as speakers and actors of mathematics in school classrooms ... the elements of identity include: the ways in which the mathematical activities have been framed by the teacher, the texts, and the students' previous experiences; the ways in which the social relationships have been framed; the positions produced in the classroom; and the histories and functions of the mathematical artefacts. (p. 98)

The actions of the teacher will constrain the constitution of mathematical meanings (Cobb, 1988). As students practice mathematics, their response to questions may be influenced by an interpretation of the teacher's response – a facial gesture, a tone of voice, etc. (Cobb, 1988). Teachers influence students' construction of mathematical meaning by the choice of mathematical activities and by their use of language in the classroom (Marr, 2000). "Teachers' actions ... influence the problems that students attempt to solve and thus the knowledge they construct" (Cobb, 1988, p. 92). "teachers of mathematics should introduce students to the language of mathematics as a natural part of their teaching" (Marr, 2000, p. 132). One technique that can be effective in helping students to develop a sense of themselves as practitioners of mathematics is the practice of revoicing. "Revoicing involves repeating, rephrasing, summarizing, elaborating, or translating someone else's speech" (Forman & Ansell, 2002, p. 6).

A strategic element of a mathematical rationality is the strategy of critically examining results, always asking new questions (vanOers, 2001). "Constructing meaning and negotiating meaning by constructing and evaluating new predicates is a way of talking about the processes that take place in a mathematical discourse" (vanOers, 2001, p. 77). The meaning that students assign to mathematics is discursively constituted. "From a historically advanced point of view, the teacher's responsibility ... is one of introducing new cultural elements in the discourse that could never be put forward by the pupils themselves" (vanOers, 2001, p. 75). The teacher mediates the development of mathematical meaning by orchestrating the discourse of the classroom (vanOers, 2001).

The Role of the Student

The student in the mathematics classroom should be an active participant in the

practice of mathematics. The student should evolve into a reflective practitioner of the practice of mathematics (vanOers, 2001), through participation in the discourse of mathematics. The student contributes to the evolution of social norms (Cobb &Yackel, 1996) in the mathematics classroom community, and to the development of classroom practices (Cobb, 1994).

Students' construction of meaning is a social as well as an individual process. Students' notions of what is mathematical and what is not are discursively constituted within the community of the practice of mathematics; particularly, within the classroom community. "the notion of what is mathematical and what not is developed in education, and the mastery of this value marks significantly those who will be acknowledged as mathematically educated ... and who can't" (vanOers, 2001, p. 61).

Students develop their understanding and interpretation of the language, symbols, representations, tools and inscriptions associated with the practice of mathematics as participants within the mathematical community. "learning to construct and interpret representations involves learning to participate in the complex practices of communication and reasoning in which the representations are used" (Greeno & Hall, 1997). As students learn to practice mathematics, they should develop increasing degrees of intellectual autonomy (Cobb, 1988).

Students contribute to the evolution of sociomathematical norms through their classroom participation. "in making these contributions, students reorganize their individual beliefs about their own role, others' roles, and the general nature of mathematical activity" (Cobb et al., as cited in Cobb & Yackel, 1996, p. 178). Examples of "sociomathematical norms include what counts as a different mathematical solution, a

sophisticated mathematical solution, an efficient mathematical solution, and an acceptable mathematical explanation" (Cobb & Yackel, 1996, p. 178).

Summary

When a sociocultural perspective on mathematics education is adopted, the mathematics classroom is viewed as a community of practice. The meaning of the tools, signs, and the language of mathematics is negotiated within this community (Cobb, 1988; Cobb, 2002; Cobb & Yackel, 1996; Forman & Ansell, 2002; Greeno & Hall, 1997; Lerman, 2001; Marr, 2000; vanOers, 2001; vanOers, 2002; Sfard, 2001; Sfard, 2002; Sfard & McClain, 2002). The teacher functions as a mediator of mathematical meanings and students actively contribute to the development and evolution of sociomathematical norms (Cobb, 1994; Cobb, 2002; Cobb & Yackel, 1996; Greeno & Hall, 1997; Kieran, et al., 2001; Lerman, 2001; vanOers, 2001; vanOers, 2002; Marr, 2000; Sfard, 2001; Sfard, 2002; Sfard & McClain, 2002; Stodolsky, 1985).

The Community College

In 2007, the American Association of Community Colleges (AACC) counted 1,202 community colleges in the United States (AACC, 2007); these are a mixture of public, independent (private), and tribal institutions (AACC, 2007). When students in both credit and non-credit courses are counted, the community college forms the largest sector of American higher education (Change, 1990). The following sections describe the mission of the community college, students at the community college, and faculty at the community college.

The Mission of the Community College

The mission of the community college is described as the functions of the community

college (Cohen & Brawer, 1996), the roles of the community college (Grubb, 1999), and the foci of the community college (Bragg, 2001; Weisman & Longacre, 2000). These include: academic preparation for transfer to a four-year college or university (Almeida, 1991; Bragg, 2001; Cohen & Brawer, 1996; Guffey, Rampp, & Masters, 1998; Levin, 2000; Weisman & Longacre, 2000); occupational, vocational, or technical preparation (Bragg, 2001; Cohen & Brawer, 1996; Grubb, 1999; Guffey et al., 1998; Levin, 2000; Weisman & Longacre, 2000); precollege, developmental, or remedial education (Bragg, 2001; Cohen & Brawer, 1996; Grubb, 1999; Guffey et al., 1998; Levin, 2000; Perin, 2006; Weisman & Longacre, 2000); community service (Bragg, 2001; Cohen & Brawer, 1996; Grubb, 1999); and continuing education (Bragg, 2001; Cohen & Brawer, 1996). The community college has been described as "a portal to higher education" (Bragg, 2001, p. 95) and as a "gateway to higher education for the nontraditional student" (Miller, Pope, & Steinmann, 2005, p. 65).

Focus on Community

Multiple characterizations of the relationships established between a community college and its community are discussed in the literature. Saunders and Bauer (1998) depict a focus on the local community as a strength of the community college. Morgan (2000) characterizes the community college as "a hub of local networks of community education services" (p. 230). Weisman and Longacre (2000) describe the relationship of a community college to its community as a defining characteristic and discuss how the community college provides a diverse curriculum to meet the needs of the local community. Based on the high proportion of non-degree seeking students, Voorhees and Zhou (2000) propose a role change for the community college from "a junior college

model ... to a community learning center model" (p. 22). In contrast, Levin (2000) contends that, based on findings from a research study of the mission of the community college, the community college is becoming a globalized institution. Grubb (1999) suggests that the entrepreneurial spirit of community colleges and their eagerness to expand to new markets make them more responsive to changing economic and demographic conditions than other institutions of higher education.

Challenges to the Mission of the Community College

A challenge to the multiple missions of the community college is its open admissions policy. Grubb (1999) describes open admissions as a "defining characteristic of the community college" (p. 212) and provides a discussion of the implications of this policy for the practice of teaching at the community college. Weisman and Longacre (2000) emphasize the inclusion of working with underprepared students as a mission of the community college. Almeida (1991) describes differing views on the open admission policy, the roles of the community college, and the challenges that underprepared students provide for community college faculty and staff. Perin (2006) conducted a study of assessment and placement policies at the community college and describes the tension between providing access and maintaining standards. Weisman and Longacre (2000) as well as Bryant (2001) describe the struggle to balance access and standards.

Students at the Community College

Multiple authors (Bragg, 2001; Brookfield, 2002; Grimes & David, 1999; Grubb, 1999; Pascarella, 1997; Somers, Haines, Keene, Bauer, Pfeiffer, McCluskey, et al., 2006) compare community college students to their four-year college counterparts. In comparison with their four-year counterparts, Bragg (2001) describes community college

students as: "older, more likely to be women and members of racial/ethnic groups, less likely to be attending full-time because they are working and taking care of family, more likely to be the first person in the family to attend college" (p. 95). Stokes and Somers (as cited in Somers, Haines, Keene, Bauer, Pfeiffer, McCluskey, et al., 2006) characterize community college students as "more likely to be independent financially, work outside the college, have no high school diploma, and have lower academic achievement" (p. 56). In contrast to their counterparts at four-year colleges and universities, Pascarella (1997) describes " disproportionate numbers of commuting, part-time, older, non-white, working-class students [at the community college]" (p. 15). Students at the community college are a diverse group (Bragg, 2001; Brookfield, 2002; Grimes & David, 1999; Grubb, 1999; Kim, 2002; Saunders & Bauer, 1998). These diversities influence the campus climate (Saunders & Bauer, 1998), teaching practices (Almeida, 1991; Grubb, 1999), and the perceptions of the community college in the research community (Pascarella, 1997).

Educational Objectives of Community College Students

The diverse nature of students at the community college is reflected in their stated reasons for enrolling at the community college. These include to better themselves financially (Bryant, 2001), to obtain or to improve job skills (Bryant, 2001; Golddrick-Rab, 2007; Grubb, 1999), to fulfill a personal interest (Bryant, 2001; Goldrick-Rab, 2007), to earn a degree (Bryant, 2001), or to transfer to a senior institution (Bryant, 2001; Goldrick-Rab, 2007). Kim (2002) describes educational objectives of community college students as academic transfer, vocational/technical education, remedial and continuing education, and community service. In reporting on results of a survey of credit and non-

credit students and their reasons for enrolling at the community college, VanDerLinden (2002) suggested response clusters for "upgrading skills for career advancement, career preparation, major life change, personal enrichment/intellectual development with intent to transfer, transfer only, and no definite purpose for enrolling" (p. 2). In attempting to develop a model of choice for the community college, Somers et al. (2006) surveyed students at six different community colleges. They developed a model with "factors categorized into three areas: aspirations and encouragement, institutional characteristics, and finances" (p. 64). Based on a survey of credit and noncredit students, Clagett (1989) proposed a typology of goals including personal enrichers, job seekers, transfer preparers, job upgraders, and explorers. Laanan (2000) characterizes the community college as a democratic environment where it is safe for students to explore their diverse goals.

Challenges to the Achievement of Educational Objectives

A characteristic of community college students that significantly affects achievement of their goals is lack of academic preparation. Community college students are consistently described as underprepared or requiring developmental or remedial education (Almeida, 1991; Byrd & MacDonald, 2005; Grubb, 1999; Hoyt, 1999; Perin, 2006). Miller et al. (2005) suggest that one of the dominant categories of reasons for enrolling at the community college is "deficiency reasons" (p. 64). Perin (2006) describes developmental education as "central to the mission of the community college" (p. 340) and notes that all publicly funded community colleges offer developmental education programs. She then notes contrasting views on the effectiveness of developmental education. In a study of three freshman cohorts – 1993, 1994, 1995 – at an urban community college, Hoyt (1999) found that the high remedial population at the

college significantly increased dropout rates and influenced the overall student grade point average. In a study of the challenges and stressors faced by community college students, Miller et al. (2005) found that achieving academic success was the most challenging factor for participants in the study. The authors note that the diverse nature of students results in differing definitions of academic success and the importance of gaining a better understanding of how community college students define academic success.

An additional challenge to the achievement of student goals at the community college is balancing their academic and personal lives (Miller et al., 2005). In a discussion of the perspectives of community college students, Saunders and Bauer (1998) note that education is often not the primary focus for community college students – they are "characterized by limited time, multiple demands, and a desire to improve economically" (p. 15). In their study of challenges and stressors faced by community college students, Miller et al. (2005) describe how three-fourths of respondents reported working outside the home. Results of a survey of community college students indicate that more than one-third of community college students are the major household earner (VanDerLinden, 2002). Goldrick-Rab (2007) reports that nearly the same number are parents. Almost all community college students are nonresidential and commute to class (Kim, 2002; McClenney & Greene, 2005). These factors lead to a lack of academic and social integration that effects overall persistence in college (McClenney & Greene, 2005; Napoli & Wortman, as cited in Bryant, 2001).

Contradictory Expectations

The common expectation that students who enroll for courses do so with the intention

of completing the courses is not a reasonable expectation for community college students. Grubb (1999) found that attrition is almost fifty percent in the first few weeks of a course at most community colleges. Harlow and Cummings (2003) describe how some students are not motivated to participate in college. Manski (1989) contends that the decision to enroll in (postsecondary) school be considered as a decision to initiate an experiment. He further suggests that dropout statistics for postsecondary education should not be considered normative due to the possibility that students are experimenters and because postsecondary enrollment is voluntary. Grubb (1999) notes that dropouts may be "experimenters who find the course not to their liking, students who find the requirements too hard, and those whose personal lives become disrupted" (p. 214).

In addition to the expectation of course completion, there is a common assumption that students who enroll at a postsecondary institution do so with the intention of earning a degree or certificate. Clagett and Huntington (1992) propose that in reporting on transfer and subsequent achievement at a senior institution, the variety of student reasons for attending the community college and varying patterns of attendance should be considered. In reporting on results of a study of persistence at a community college over a three-year period, Grimes and David (1999) caution that persistence is an "illusive measure" (p. 79) because "nonpersisters may be stopouts or opt-outs who will leave in good standing to work, raise a family, or pursue other goals but return later to pursue a degree or other personal objectives" (p. 79).

In a discussion of student intentions and persistence, Voorhees and Zhou (2000) note that Clagett's typology of community college student goals indicates that less than one-fifth of community college students enroll with the goal of transfer preparation. While

acknowledging that students vary in expectations for earning a college credential, Goldrick-Rab (2007) describes the failure of community college students to complete a degree within six years of the initial transfer to college as a "lack of curricular momentum" (p. 1). Bryant (2001) suggests that the context of the community college be considered when interpreting institutional transfer, persistence, or degree completion rates. Pascarella (1997) proposes that the research community "rethink and expand the notion of desirable outcomes of college" (p. 17) to include other types of outcomes that are sensitive to the types of maturing that are consequences of the nature of the community college experience, "successfully attend[ing] to work and family as well as to educational responsibilities" (p. 17).

Faculty at the Community College

There is a consensus in the literature that faculty choose to work at the community college because of a perceived emphasis on teaching. In a study of community college faculty, Grubb (1999) found that most instructors in the study were committed to teaching. In a qualitative study of new faculty at a community college, Fugate and Amey (2000) found that one aspect of the community college that attracted the participants to apply for a faculty position at a community college was the focus on teaching. This is supported by findings by Twombley (2005) and Kozeracki (2002). In an analysis of hiring practices at three community colleges, Twombley (2005) found that quality of teaching was among the common values evident in the respective hiring processes. In an analysis of data from three national studies of faculty, Kozeracki (2002) noted that community college faculty have the clearest sense of purpose of any sector of higher education and that clarity of commitment to teaching is an important element of job

satisfaction for community college faculty. Grubb (1999) describes a distinctive feature of community college teachers as a "basic sympathy" (p. 38) for students that is reflected in the levels of support that faculty provide for students.

A Sense of Isolation

A common finding in studies of teaching at the community college is a sense of isolation among the faculty. Fugate and Amey (2000) describe how, although participants in their study of faculty members at a community college defined their professional role as teacher during individual interviews, there was a lack of awareness that others shared the same perception of their role. Grubb (1999) describes how community college faculty members' lives are marked by isolation from other faculty members – their primary work is conducted in the classroom, separate from their colleagues; departments may be scattered across the campus; some departments have few faculty members; and collective faculty groups serve primarily political purposes. In a review of the educational literature, Outcalt (2000) found faculty isolation among the described obstacles to good teaching. Grubb (1999) and Outcalt (2000) describe the organization of learning communities as a way of alleviating faculty isolation. In addition, learning communities enhance the teaching and learning experience for both faculty and students.

Part-Time Faculty

A common topic of discussion in the literature concerns part-time faculty members at the community college – their increasing numbers (Dickson, 1999; Grubb, 1999; Outcalt, 2000; Schuetz, 2002), their practices (Schuetz, 2002), and the roles that they may or may not be expected to accept (Dickson, 1999). Outcalt (2000) contends that "a growing

reliance on part-time faculty who are accorded substantial teaching loads without concomitant institutional support" (p. 58) serves as an obstacle to effective teaching at the community college. Cohen (as cited in Dickson, 1999) describes the differences in the roles of full-time and part-time faculty in terms of responsibilities outside the classroom. In a study of the teaching practices of full-time and part-time community college faculty, Schuetz (2002) found statistically significant differences in results describing the distribution of instructional practices, faculty availability to students, and connections with colleagues and the institution. Grubb (1999) notes how part-time faculty members were originally hired for their particular expertise and are now more likely to be hired for fiscal reasons. Some authors speak positively about the use of part-time faculty at the community college – Saunders and Bauer (1998) characterize the use of part-time faculty members from local businesses as an advantage that reflects and strengthens the community college's focus on the local community. Dickson (1999) notes that "research has shown that there is no significant difference in the quality of instruction generally provided by part-time faculty" (p. 26).

Conducting Research

In addition to their teaching duties, faculty members in higher education are often expected to conduct research. In a study of community college hiring practices, Twombley (2005) found that one reason that some community college faculty chose to work at the community college was for the emphasis on teaching rather than research. In their study of new faculty at a community college, Fugate and Amey (2000) found that among the participants, an additional factor that attracted the participants to consider teaching at the community college was avoidance of the research-driven tenure process at

the university. Outcalt (2000) describes how increasing pressure on community college faculty members to conduct research has been noted in the literature. Although the participants in the study by Fugate and Amey (2000) were reluctant to work where research was required, a finding was that faculty members engaged in types of research that included assessment and indicators of student success. A report from the Carnegie Foundation (Change, 1990) suggests that the definition of scholarship at the academy as research activity be expanded to include "the discovery of knowledge, the integration of knowledge, the application of knowledge, and the transmission of knowledge ... as legitimate forms of scholarship" (p. 27).

Challenges for Faculty at the Community College

The diverse nature of community college students provides many challenges for community college faculty. Brookfield (2002) portrays the community college setting as "the ultimate in diverse, open-entry, mixed-ability classrooms" (p. 37). A particular aspect of this diversity that is an expressed concern of community college faculty is the underprepared nature of many community college students (Almeida, 1991; Byrd & MacDonald, 2005; Change, 1990; Grubb, 1999; Hoyt, 1999; Perin, 2006). Faculty members describe the frustration of working with underprepared students (Almeida, 1991), and dissatisfaction with the level of academic preparedness of students (Kozeracki, 2002). This frustration and dissatisfaction can lead to demoralization (Almeida, 1991) and burnout (Fugate & Amey, 2000; Grubb, 1999). Brookfield (2002) suggests that reflecting critically on their practice can help community college faculty to face the reality that they cannot influence all students to learn successfully. Grubb (1999) describes the unwillingness of community college faculty to label students as " 'deficient'

or 'not college material'" (p. 37).

Classroom Practices

Pascarella (1997) suggests that "the classroom experience is likely to be the major institutional influence on the vast majority of community college students" (p. 16). In a study of teaching at the community college, Grubb (1999) found a variety of classroom practices. The lecture method is the most common form of classroom instruction at the community college (Dickson, 1999; Grubb, 1999; Schuetz, 2002). In an analysis based on the 2000 Center for the Study of Community Colleges survey, Schuetz (2002) reported that the majority of class time is spent in the following manner "an average of 43 percent of class time for lectures, 15 percent for class discussions, and 11 percent for quizzes, and examinations" (p. 40). Grimes and David (1999) suggest that conventional teaching practices may not work with the diverse population of community college students. Almeida (1991) contends that community college faculty must change their teaching practices to accommodate the learning needs of the diverse student population. Harlow and Cummings (2003) describe relational patterns of community college students and suggest a model of transformative learning. We are reminded by Grubb (1999) that there is no empirical evidence of the effectiveness of a particular instructional technique.

Summary

Community colleges fulfill multiple missions, with a focus on the needs of their local community (Almeida, 1991; Bragg, 2001; Cohen & Brawer, 1996; Grubb, 1999; Guffey et al., 1998; Levin, 2000; Morgan, 2000; Perin, 2006; Saunders & Bauer, 1998; Weisman & Longacre, 2000). Students at the community college are diverse in nature, differing from their four-year college counterparts in age, gender, race, enrollment status,

academic preparation, and educational objectives (Almeida, 1991; Bragg, 2001; Brookfield, 2002; Bryant, 2001; Byrd & MacDonald, 2005; Change, 1990; Clagett, 1989; Goldrick-Rab, 2007; Grimes & David, 1999; Grubb, 1999; Hoyt, 1999; Kim, 2002; Laanan, 2000; McClenney & Greene, 2005; Miller et al., 2005; Napoli & Wortman, as cited in Bryant, 2001; Pascarella, 1997; Perin, 2006; Saunders & Bauer, 1998;Somers et al., 2006; Voorhees & Zhou, 2000; Weisman & Longacre, 2000). There is a perceived focus on teaching at the community college, reflected in hiring practices and, consequently, the nature of community college faculty (Fugate & Amey, 2000; Grubb, 1999; Kozeracki, 2002; Twombley, 2005). The nature of community college students influences teaching practices at the community college (Almeida, 1991; Grimes & David, 1999; Grubb, 1999; Harlow & Cummings, 2003; Pascarella, 1997).

Chapter Summary

The discourse of teachers of adults includes a perception of their roles, andragogical orientation, and teaching practices. The research literature of adult education includes multiple characterizations of the roles that adult educators assume and metaphors used to describe these roles. The metaphors of guide (Apps, 1989; Fenwick, 1996; Galbraith, 1998; Grubb, 1999; Hativa & Birenbaum, 2000; Henschke, 1989a) and mentor (Bourdon & Carducci, 2002; Galbraith, 1998; Galbraith & James, 2004; Imel, 1999) are recurrent themes in the literature. The role of the adult educator as mentor (Galbraith, 1998; Imel, 1999) is consistently mentioned in the literature, as well as roles that include a responsibility for instruction and learning (Bess, as cited in Galbraith & James, 2004; Crow, 1980; Ellis & Berry, 2005; Galbraith, 1998; Heimlich & Norland, 2002; Ross-Gordon, 2002).

A model for the work of adult educators was proposed by Malcolm Knowles (1968) based on the concept of andragogy. A foundational assumption of andragogy is that the learner is self-directed (Brookfield, 1986). Andragogical practices may be situationally appropriate (Brookfield, 1986; Carlson, 1980; Davenport, 1987; Holmes, 1980; Knowles, 1980; McKenzie, 1985; Merriam, 2001; Pratt, 1988; Rachel, 2002). There are multiple perspectives on andragogical and pedagogical practices (Carlson, 1980; Cross, 1981; Davenport & Davenport, 1985b; Delahaye et al, 1994, Elias, 1979; Knowles, 1980; McKenzie, 1985; Rachel, 1983).

The notion of situationally appropriate practices influences the teaching practices of adult educators (Brookfield, 1986; Brookfield, 1992; Conti, 1985a; Conti, 1985b; Conti & Wellburn, 1986; Darkenwald, 1989; Merril, 2001l). Multiple research findings support contentions regarding the appropriateness and effectiveness of particular instructional techniques (Beder & Darkenwald, 1982; Bourdon & Carducci, 2002; Brookfield, 1986; Conti, 1985a; Ediger, 1999; Endorf & McNeff, 1991; Grasha, 1994; Grubb, 1999; Humphrey-Brown & Uhde, 2000; Kerwin, 1981; Merril, 2001). The American Mathematical Association of Two-Year Colleges (AMATYC), the professional organization for two-year college mathematics educators, has proposed a set of standards for teaching mathematics at the two-year college (AMATYC, 1995) that are consistent with the philosophies and practices of adult education.

Relatively few sources that directly describe a sociocultural perspective on adult education may be found in the literature. Pratt and Nesbit (2000) note five discourses on the nature of teaching and learning in adult education, including a sociocultural discourse. Within the sociocultural discourse, teaching and learning are social in nature, occurring

within communities of practice (Alfred, 2002b; Bonk & Kim, 1998; Pratt & Nesbitt, 2000). The sociocultural discourse on adult education has been described as "promising" (Alfred, 2002a) and "inviting and informative" (Bonk & Kim, 1998). Bonk and Kim (1998) note challenges for the impact of sociocultural theory on adult education that include a lack of research and scholarly work that directly link sociocultural theory and adult learning.

From a sociocultural perspective, knowledge and learning are constituted within communities of practice (Bonk & Kim, 1998), mediated by experiences within a community (Hansman, 2001) and rooted in learners' participation in communities of practice (Jacobson, 1996; Lave & Wenger, as cited in Jacobson, 1996; Merriam, et al., 2003). Learning is social in nature (Brown et al., 1989; Hansman, 2001; Hansman & Wilson, 2002; Lave, 1996; Merriam et al., 2003; Pekarek Doehler, 2002; Pratt & Nesbitt, 2000; Wilson, 1993). The classroom may be viewed as a community of practice (Merriam et al., 2003). Research findings support the notion that classroom experiences influence cognitive development (Kasworm, 2003; Pekarek Doehler, 2002; Tsui, 1999).

Learning is mediated through the use of tools and signs (Wertsch, 1991), the meanings of which are negotiated within a community of practice (Brown et al., 1989). The tools and signs of adult education include computers and software (Bonk & Kim, 1998; Hansman, 2001; Wilson, 1993), written language (Bonk & Kim, 1998; Hansman, 2001), and algorithms, routines, and definitions (Brown, et al., 1989). The influence of tools and signs on the teaching and learning of adults is discussed by Bonk and Kim (1998), Brown et al. (1989), and Hansman and Wilson (1998).

When learning and teaching are perceived as being social in nature, relationships of

power must be considered (Bedi, 2004; Brookfield, 1995; Cafferella & Merriam, 1989; Colin & Heaney, 2001; Edwards, 1991; Hansman & Wilson, 1998; Hansman & Wilson, 2002; Jacobson, 1996; Jarvis, 1997, Johnson-Bailey et al, 1997; Pekarek Doehler, 2002; Sanguinetti et al., 2005). Jarvis provides examples for dimensions of power and authority. Sanguinetti et al. (2005) describe the evolution of the classroom learning community through the development of a model of "power with" rather than "power over" (p. 23). Colin and Heaney (2001) provide a description of the negotiation of power in a graduate program. Jarvis (1997), Pekarek Doehler (2002), and Alfred (2002b) discuss the need for community members to participate in the negotiation of power relations within a discourse community.

The research literature of mathematics education includes many references to the sociocultural perspective (Cobb, 1988; Cobb, 1994; Cobb & Yackel, 1996; Forman & Ansell, 2002; Greeno, 1997; Kieran et al., 2001; Lerman, 2001; vanOers, 2001; vanOers, 2002; Marr, 2000; Schoenfeld, 1992; Sfard, 2001; Sfard & McClain, 2002; Stodolsky, 1985). An emergent perspective integrates the discourses of constructivism and socioculturalism. Contrasts between the constructivist and the sociocultural perspectives on knowledge include: acquisition versus participation (Kieran et al., 2001), the nature of mathematical meaning (Cobb, 1988), the role of teachers and students (Cobb, 1988; Cobb, 1994; Forman & Ansell, 2002; Greeno, 1997; VanOers, 2001; vanOers, 2001; Sfard, 2001), and relationships of power (Lerman, 2001; vanOers, 2001).

The study of mathematics may be likened to initiation and acceptance into a culture (Lerman, 2001; vanOers, 2001; Sfard, 2001; Sfard & McClain, 2002). In the culture of mathematics, there are conventions for the use of language, symbols and representations

(Greeno & Hall, 1997), tools (Cobb, 2002; vanOers, 2002; Sfard & McClain, 2002), and inscriptions (Forman & Ansell, 2002; Lerman, 2001; Sfard & McClain, 2002) and social norms for what constitutes mathematical activity (Cobb & Yackel, 1996). Knowledge and understanding are mediated through the use of tools (Lerman, 2001; vanOers, 2002; Sfard, 2001; Sfard, 2002; Sfard & McClain, 2002) and language (vanOers, 2001).

It is within the mathematics classroom community that students are socialized to mathematical content (Cobb, 2002), to notions of what constitutes mathematical activity (Cobb, 2002; vanOers, 2001), and to sociomathematical norms (Cobb & Yackel, 1996). The teacher is expected to contribute to the classroom forum not only knowledge of educational techniques, but also an understanding and interpretation of the language, symbols, representations, tools, and inscriptions associated with the practice of mathematics (Schoenfeld, 1992). The student is expected to be an active and reflective participant in the practice of mathematics (Cobb, 1994; Cobb & Yackel, 1996; vanOers, 2001).

When students enrolled for both credit and non-credit courses are counted, the community college forms the largest sector of American higher education (Change, 1990). Mission foci of the community college include academic preparation for transfer to a four-year college or university; occupational, vocational, or technical preparation; precollege, developmental, or remedial education; community service; and continuing education (Almeida, 1991; Bragg, 2001; Cohen & Brawer, 1996; Grubb, 1999; Guffey et al., 1998; Levin, 2000; Perin, 2006; Weisman & Longacre, 2000).

Students at the community college are diverse in age, gender, race, academic preparation, and enrollment status (Almeida, 1991; Bragg, 2001; Brookfield, 2002;

Bryant, 2001; Byrd & MacDonald, 2005; Change, 1990; Clagett, 1989; Goldrick-Rab, 2007; Grimes & David, 1999; Grubb, 1999; Hoyt, 1999; Kim, 2002; Laanan, 2000; McClenney & Greene, 2005; Miller et al., 2005; Napoli & Wortman, as cited in Bryant, 2001; Pascarella, 1997; Perin, 2006; Saunders & Bauer, 1998;Somers et al., 2006; Voorhees & Zhou, 2000; Weisman & Longacre, 2000). The diverse nature of students at the community college is reflected in their reasons for enrolling (Bryant, 2001; Clagett, 1989; Goldrick-Rab; Grubb, 1999; Kim, 2002; Laanan, 2000: Somers et al., 2006; VanDerLinden, 2002). Community college students are consistently described as underprepared, multiple authors note how this provides challenges to the mission of the community college, the achievement of student objectives, and the classroom practices of faculty members (Almeida, 1991; Brookfield, 2002; Bryant, 2001; Byrd & MacDonald, 2005; Fugate & Amey, 2000; Grubb, 1999; Hoyt, 1999; Kozeracki, 2002; Miller et al., 2005; Perin, 2006; Weisman & Longacre, 2000). Although community college students are consistently characterized as underprepared, Grubb (1999) notes the unwillingness of community college faculty to label students as "deficient" (p. 37) or "not college material" (p. 37), and describes a "basic sympathy" (p. 38) for students that is reflected in the levels of support that faculty provide for students.

Findings from studies of faculty at the community college support the notion of a perceived emphasis on teaching (Fugate & Amey, 2000; Grubb, 1999; Kozeracki, 2002; Twombley, 2005). It is noted in the literature (Kozeracki, 2002) that community college faculty have the clearest sense of purpose of any sector of higher education; and that clarity of commitment to teaching is an important element of job satisfaction for community college faculty. Interestingly, the finding of a sense of isolation among

community college faculty members is reported in the literature (Fugate & Amey, 2000; Grubb, 1999; Outcalt, 2000). A significant thread in the literature about the community college concerns part-time faculty members – their increasing numbers, their teaching practices, their roles – and the advantages and disadvantages of the use of part-time faculty members at the community college (Dickson, 1999; Grubb, 1999; Outcalt, 2000; Saunders & Bauer, 1998; Schuetz, 2002). An evolving thread in the literature about community college faculty is the issue of conducting research (Fugate & Amey, 2000; Outcalt, 2000; Twombley, 2005) and the nature of research at the community college (Change, 1990).

In summary, from a sociocultural perspective, meaning is negotiated within communities of practice. The communities of practice discussed here are the adult education community, the mathematics education community, and the community college teaching environment. Mathematics faculty members at the community college are members of each of these communities of practice.

For each community of practice, there are expected roles for participants and expected practices associated with these roles. Adult educators are expected to apply andragogical principles of practice as they facilitate learning. Mathematics educators are expected to guard the content of mathematics as they mediate mathematical meanings for their students. Community college faculty members are expected to provide effective learning experiences for a diverse set of learners. Mathematics faculty members at the community college face a unique set of challenges – performing the roles and adhering to the accepted practices for each of these communities of practice.

This chapter has provided a review of the literature of adult education pertaining to

the discourse of teachers of adults, a sociocultural perspective on adult education, and the community college. In addition, a review of the literature of mathematics education providing a sociocultural perspective was discussed. The methodology for this study will be introduced in Chapter three. A report of the findings from this study is presented in Chapter four. Chapter five provides a summary and discussion of the findings from this study.

Chapter 3: Methodology

Teaching practices are influenced by beliefs about teaching and learning (Apps, 1989; Brookfield, 1986; Conti, 1985a; Conti, 1985b; Conti & Kolody, 1998; Conti & Wellburn, 1986; Crow, 1980; Fuhrman & Grasha, 1983; Galbraith, 1998; Handal, 2003; Heimlich & Norland, 2002; Henschke, 1989a; Pratt, 2002; Ross-Gordon, 2002). The research literature of adult education supports the need for adult educators to reflect critically on their practice and the beliefs that inform their practice (Apps, 1989; Bourdon & Carducci, 2002; Brookfield, 1986; Brown & Smith, 1997; Conti, 1985a; Conti, 1985b; Conti & Kolody, 1998; Conti & Wellburn, 1986; Crow, 1980; Fuhrman & Grasha, 1983; Galbraith, 1998; Heimlich & Norland, 1994; Heimlich & Norland, 2002; Henschke, 1989a; Holmes, 1980; McKenzie, 1977; Phillips, 1981; Pratt, 1993; Pratt, 2002; Pratt, 2005; Rachel et al., 1993; Ross-Gordon, 2002; Suttle, 1982; Zinn, as cited in Galbraith, 1985). This study will investigate the beliefs, feelings, and behaviors of full-time mathematics faculty at the community college.

Research Design

The significance of this study was discussed in Chapter one. An instrument was sought that could provide a measure of the beliefs, feelings, and behaviors of mathematics faculty at the community college. The instrument must be designed for use with adult educators and be available for use in this type of study. Validity and reliability information regarding this instrument were deemed useful, as well. Other considerations were resources such as time and accessibility to a population for this study. Johnson (2001) suggests that if the primary attempt of a research study is to describe a phenomenon and to document the characteristics of a phenomenon, “then the term

descriptive non-experimental research should be applied" (p. 9). This study attempts to provide a description of the beliefs, feelings, and behaviors for a population of community college faculty and no variables will be manipulated; therefore, the design of this study may be classified as descriptive non-experimental research.

Multiple strategies for data collection are described in the literature of educational research. Three common strategies for data collection are: interviews, observations, and questionnaires or surveys (Dickinson & Blunt, 1980; Fink, as cited in Creswell, 2003; Furlong et al., 2000; Gay & Airasian, 2000; Romberg, 1992). Furlong et al. (2000) describe questionnaires or surveys as useful for the study of subjective behaviors such as attitudes, perceptions, beliefs, or feelings. Gay and Airasian (2000) describe the advantages of questionnaires or surveys as: the inexpensive nature of this technique, anonymity can be preserved, most items are easily scored, and items and procedures may be standardized. Dickinson and Blunt (1980) suggest that some of the advantages of survey research include the opportunity to sample a population, the opportunity to repeat the survey with the same population to determine trends over time, and the identification of additional lines of inquiry.

A limitation of the use of questionnaires or surveys is the possibility of misinterpretation of questions (Furlong et al., 2000; Gay & Airasian, 2000). Other disadvantages cited by Gay and Airasian (2000) include a possible low response rate, the requirement that participants must be literate, and the constraint of participants not being able to explicate their responses. Dickinson and Blunt (1980) cite the difficulty of establishing reliability and validity of responses and the opportunity for error or bias as disadvantages of this form of data collection. In addition, they suggest that "whenever

possible, existing instruments with known reliability and validity should be selected" (p. 58).

Four instruments from the research literature of adult education were considered for use in this study. These instruments are: the Educational Orientation Questionnaire (EOQ), the Philosophies of Adult Education Inventory (PAEI), the Principles of Adult Learning Scale (PALS), and the Instructional Perspectives Inventory (IPI). All of these instruments provide adult educators with an opportunity to clarify a set of beliefs about adult learners.

The Educational Orientation Questionnaire (EOQ) was designed by Hadley (1975) to measure the andragogical orientation of adult educators. The EOQ was rejected for use in this study because the use of andragogical practices may be situationally specific (Brookfield, 1986; Carlson, 1980; Davenport, 1987; Holmes, 1980; Knowles, 1980; McKenzie, 1985; Merriam, 2001; Pratt, 1988; Rachel, 2002). The Philosophies of Adult Education Inventory (PAEI) was designed by Zinn (1983) to provide a measure of the philosophical orientation of adult educators. The PAEI was rejected for use in this study because it does not directly address the practice of adult educators. The Principles of Adult Learning Scale (PALS) was designed by Conti (1978) to provide a measure of the application of andragogical principles in terms of the use of collaborative learning. Due to the focus of this instrument on a specific instructional technique for adult education – collaborative learning – the instrument was rejected for use in this study.

The Instructional Perspectives Inventory (IPI) was developed by Henschke (1989) as an instrument to provide a measure of the beliefs, feelings, and behaviors of adult educators. The IPI measures seven factors: teacher empathy with learners, teacher trust

of learners, planning and delivery of instruction, accommodating learner uniqueness, teacher insensitivity to learners, learner-centered learning process, and teacher-centered learning process. The IPI was chosen for this study due to its nature as an instrument that provides a measure not only of beliefs and feelings, but also of reported behaviors. Permission has been granted by Henschke to use the instrument for this study (Appendix A).

Instrumentation

This section of Chapter three will provide a description of the Instructional Perspectives Inventory (IPI) and a brief description of previous studies using the IPI. In addition, the topics of validity, reliability, and generalizability will be addressed.

The Instructional Perspectives Inventory

The Instructional Perspectives Inventory (IPI) was designed by Henschke as an instrument to provide a measure of the beliefs, feelings, and behaviors of adult educators or potential adult educators (Henschke, 1989b). The instrument consists of 45 questions with responses arranged on a four-point Likert scale. In determining construct validity for the instrument, Stanton (2005) modified the scale of responses to a five-point Likert scale (Appendix B). Response choices for the 45 items of the Instructional Perspectives Inventory (IPI) corresponding to a five-point Likert scale and their associated values are: "almost never" – 1 point; "not often" – 2 points; "sometimes" – 3 points; "usually – 4 points; and "almost always" – 5 points. The modified version of the IPI was used in this study.

Studies Using the Instructional Perspectives Inventory

Seven studies using the Instructional Perspectives Inventory (IPI) may be found in the

literature of adult education. Henschke (1989a, 1989b, 1994) describes the development of the IPI and initial findings with two groups of adult educators at two different Midwestern community colleges. The IPI was used for dissertation research by Thomas (1995) and Seward (1997) with groups of parent educators; by Dawson (1997) and Drinkard (2003) with groups of nurse educators; and by Stricker (2006) with a set of school teachers and administrators. Stanton (2005) investigated construct validity for the IPI. Brief descriptions for each of these studies are presented in chronological order.

Henschke, 1989

Henschke tested and refined the original instrument (IPI) with groups of adult educators (n = 389 and n = 210, respectively) at two Midwestern community colleges. A factor analysis resulted in 45 items arranged in clusters of seven factors: teacher empathy with learners, teacher trust of learners, planning and delivery of instruction, accommodating learner uniqueness, teacher insensitivity to learners, learner-centered learning process, and teacher-centered learning process.

In a discussion of the findings from both groups of adult educators, Henschke (1989b) noted that when the IPI scores were ranked from highest to lowest, the highest scores for each group were associated with Factor 1: Teacher empathy with learners and Factor 2: Teacher trust of learners. This was considered by Henschke (1989b) to be a significant finding because "it is important for theory and practice to be congruent in adult education" (p. 76).

Thomas, 1995

Thomas conducted a pilot study to determine reliability for the IPI with a group (n = 17) of parent educators. He then conducted a study with a larger group (n = 200) of

parent educators using a modified version of the IPI. The stated primary purpose of the study "was to identify the instructional perspectives held and practiced by parent educators, while working with parents as learners" (p. 41). An Analysis of Variance (ANOVA) was conducted for each of the seven factors of the IPI in terms of five demographic variables for the study population: position status (full-time or part-time), length of service, educational background, age, and gender. Statistically significant findings are reported in Table 2. Values for Cronbach's alpha reliability coefficient are reported in Table 3.

Dawson, 1997

Dawson conducted a study of nurse educators (n = 242) in nursing programs in a Midwestern metropolitan area. The stated purpose of the study was "to identify the group mean differences of respondents rating the seven factors of instructional perspectives ... held and practiced by nurse educators" (p. 3). An ANOVA was conducted for each of the seven factors of the IPI in terms of seven demographic variables for the study population: age, entry basic nursing education, number of years teaching nursing, gender, highest degree obtained, ethnic identity, and whether or not participants had completed a course in adult education. Statistically significant findings are reported in Table 2.

Seward, 1997

Seward conducted a study of parent educators (n = 157) in a Midwestern state. The purpose of the study was to identify instructional perspectives of parent educators as they worked with parents, with parents considered as adult learners. An ANOVA was conducted for each of the seven factors of the IPI in terms of ten demographic variables:

age, length of service, hours of Parents as Teachers (PAT) in-service training, educational level, major field of study, employment status (full-time or part-time), parental status, age of youngest child of parent educator, ethnicity, and geographic setting. Statistically significant findings are reported in Table 2.

Drinkard, 2003

Drinkard conducted a study of nursing faculty (n = 35) at a Midwestern university. The participants in the study were nursing faculty instructing in distance learning formats. An ANOVA was conducted for each of the seven factors of the IPI in terms of five demographic variables: age, number of years teaching nursing, number of semesters teaching distance education courses, highest degree earned, formal exposure to adult education concepts, and campus location. Statistically significant findings are reported in Table 2.

Stanton, 2005

Stanton conducted a study to determine construct validity for the Instructional Perspectives Inventory (IPI). Participants (n = 238) in the study were adult educators from multiple countries and American states. Both the IPI and the Self-directed Learning Readiness Scale (SDLRS) by Guglielmino were administered. Analysis of the data determined construct validity for the IPI.

Stanton proposed that future research studies with the Instructional Perspectives Inventory (IPI) include an analysis based on category levels for the use of andragogical principles (Table 1). In addition, Cronbach's alpha was calculated to determine internal consistency (reliability) for the IPI. Values for Cronbach's alpha reliability coefficient are reported in Table 3.

Table 1
Use of Andragogical Principles Category Levels (Stanton, 2005, p. 280)

IPI Score	Percentage	Category Level
225-199	89-100%	High above average
198-185	82-88%	Above average
149-184	66-81%	Average
124-148	55-65%	Below average
123 or less	0-54%	Low below average

Stricker, 2006

Stricker conducted a study of teachers (n = 169) and principals (n = 30) to determine attitudes "in the areas of trust and respect in school-based staff development" (p. 60). The instruments for this study include revised versions of both the Instructional Perspectives Inventory (IPI) and the Respect for Partner Scale (RPS). An ANOVA was conducted to determine if statistically significant differences existed between teacher and principal scores. Statistically significant findings are reported in Table 2.

Stricker reports a calculated Cronbach's alpha value of 0.810 for "the seven subscales of the IPI" (p. 69). He interpreted this finding, "since alpha is greater than 0.600 the items are considered unidimensional and are measuring the same thing" (p. 69). It is not made clear whether the value of Cronbach's alpha is 0.810 for each of the seven subscales. If so, a degree of internal consistency may be implied. This implication may not be extended to a summative representation of IPI subscales due to the diversity of the dimensions measured by the respective subscales. Stricker's finding of Cronbach's alpha will not be used in an interpretation of the results for this study as values for the individual subscales of Cronbach's alpha are not available.

Table 2
Statistically Significant Differences Found Among Demographic Variable Responses to the IPI - Organized by Factor

Factor (Subscale)	Demographic Variable	Sign. Level	Statistical Analyses Performed	Study Author & Year
1	Length of study in field.	0.005	ANOVA, post-hoc Newman-Keuls	Thomas (1995)
1	Years teaching nursing.	0.05	ANOVA	Dawson (1997)
1	Highest degree attained.	0.05	ANOVA	Dawson (1997)
1	Hours of PAT in-service training.	0.05	Pearson r	Seward (1997)
1	Length of service.	0.01	Pearson r	Seward (1997)
1	Age of youngest child of parent educator.	0.05	Kruskal-Wallis One-Way ANOVA	Seward (1997)
1	Job classification – teacher, principal.	0.000	MANOVA	Stricker (2006)
1	Highest degree attained.	0.000	Kruskal-Wallis One-Way ANOVA	Stricker (2006)
2	Years of service.	0.0008	ANOVA, post-hoc Newman-Keuls	Thomas (1995)
2	Years teaching nursing.	0.05	ANOVA	Dawson (1997)
2	Highest degree attained.	0.05	ANOVA	Dawson (1997)
2	Age.	0.05	Pearson r	Seward (1997)
2	Age of youngest child of parent educator.	0.1	Kruskal-Wallis One-Way ANOVA	Seward (1997)
2	Highest degree attained.	0.05	ANOVA, post-hoc Tukey HSD	Drinkard (2003)

Table 2
Statistically Significant Differences Found Among Demographic Variable Responses to the IPI - Organized by Factor (continued)

Factor (Subscale)	Demographic Variable	Sign. Level	Statistical Analyses Performed	Study Author & Year
2	Job classification – teacher, principal.	0.001	MANOVA	Stricker (2006)
3	Years of service.	0.0001	ANOVA, post-hoc Newman-Keuls	Thomas (1995)
3	Age.	0.05	Pearson r	Seward (1997)
4	Age of youngest child of parent educator.	0.1	Kruskal-Wallis One-Way ANOVA	Seward (1997)
4	Job classification – teacher, principal.	0.000	MANOVA	Stricker (2006)
5	Entry basic nursing education	0.05	ANOVA	Dawson (1997)
5	Years teaching nursing.	0.05	ANOVA	Dawson (1997)
5	College course in adult education.	0.05	ANOVA	Dawson (1997)
5	Geographic setting.	0.01	Kruskal-Wallis One-Way ANOVA	Seward (1997)
5	Gender.	0.01	MANOVA	Stricker (2006)
5	Building Level – K6 & 9-12.	0.01	Kruskal-Walis One-Way ANOVA	Stricker (2006)
5	Highest degree attained.	0.05	Kruskal-Wallis One-Way ANOVA.	Stricker (2006)
6	Highest degree attained.	0.05	ANOVA	Dawson (1997)
7	Highest degree attained.	0.05	ANOVA	Dawson (1997)
7	Employment Status – Full-time & Part-time	0.05	Kruskal-Wallis One-Way ANOVA	Seward (1997)

Validity, Reliability, and Generalizability

Furlong et al. (2000) distinguish between several types of validity, among them internal validity, external validity, content validity, and construct validity. A discussion relating the respective types of validity to this study follows.

Internal Validity

Internal validity is related to whether or not a study addresses its respective research question. It is expected that this study will have internal validity due to the nature of the instrumentation for this study.

External Validity/Generalizability

External validity is also known as generalizability. Furlong et al. (2000) define the term generalizability as: "the extent to which the conclusions drawn from a specific sample are applicable to a larger population" (p. G7). Gay and Airasian (2000) state that generalizability is related to the representativeness of a sample, the operational definition of variables, and replicability. Challenges to the external validity or generalizability of this study will include sampling bias and nonresponse bias.

A biased sample is a sample that does not represent the population from which it is drawn (Furlong et al., 2000; Gay & Airasian, 2000). The population for this study was full-time mathematics faculty members at community colleges in Missouri. Participation in this study was voluntary. The participants who responded and completed the survey represent a convenience sample of the population. They were volunteers. Volunteers may be more motivated or more interested in a particular study, thus resulting in a sampling bias (Gay & Airasian, 2000). An attempt was made to address this bias by sending reminder e-mails prompting and encouraging participants to respond. In

addition, this researcher was provided with an opportunity at a statewide meeting of the Missouri Mathematics Association for Two-Year Colleges (MOMATYC) to remind participants to respond.

Nonresponse bias is described by Lodico, Spaulding, and Voegtle (2006) as "a major barrier to generalizability of findings" (p. 168). Nonresponse bias for this study may have been expected for several reasons. Participants were invited to complete the survey through e-mail. Potential respondents may have been hesitant to open the e-mail due to the threat of a computer virus. In an attempt to address this issue, the title for each e-mail correspondence was made as benign as possible. For example, the initial e-mail was titled, "Teaching Perspectives Survey – From a MOMATYC Colleague". All e-mail titles included "From a MOMATYC Colleague". In addition to hesitation to open e-mail correspondence, potential respondents may not have felt that they could spare time from their responsibilities as faculty members to complete the survey. This was addressed by making the survey available for at least four weeks early in the semester. An additional contributing factor to nonresponse bias for this study may have been a software incompatibility issue which is discussed in the Data Collection section of this chapter. Due to the anonymity of electronic survey responses, it was not possible to directly contact nonrespondents to encourage them to participate.

An additional challenge to generalizability for this study is the nature of the community college. Community colleges in Missouri are diverse in mission and in the populations that they serve (Farnsworth, 1997). In describing challenges to generalizability of a study of two-year community college faculty conducted by Grubb and Associates, Grubb (1999) states that "community colleges ... [are] more varied than

any other type of educational institution in this country [the United States]" (p. 21).

Content and Construct Validity

An instrument has content validity when the items of the instrument represent the broad range of constructs under interest (Furlong et al., 2000). Content validity was determined in the development of the IPI through factor analysis (Henschke, 1989b). Construct validity occurs when an item measures the construct that it is designed to measure (Furlong et al., 2000). Construct validity for the IPI was determined by Stanton (2005).

Reliability

An instrument is reliable when it consistently measures what it is intended to measure (Furlong et al, 2000; Gay & Airasian, 2000; Lodico et al., 2006); consequently, reliability is also known as internal consistency. Reliability for the each factor of the IPI was determined by Thomas (1995) and Stanton (2005) using Cronbach's alpha reliability coefficient (Table 3).

Table 3
Cronbach's Alpha Values Reported in Studies with the IPI

IPI Factor	Thomas (1995)	Stanton (2005)
1. Teacher empathy with learners.	*α = 0.21*	*α = 0.6334*
2. Teacher trust of learners.	*α = 0.49*	*α = 0.8087*
3. Planning and delivery of instruction.	*α = 0.78*	α = 0.7149
4. Accommodating learner uniqueness.	*α = 0.60*	*α = 0.7118*
5. Teacher insensitivity toward learners.	*α = 0.62*	*α = 0.7787*
6. Experience-based learning techniques (learner-centered learning process).	*α = 0.71*	*α = 0.7219*
7. Teacher-centered learning process.	*α = 0.40*	*α = 0.5687*

Cronbach's alpha reliability coefficient provides a measure of the internal consistency

of test items – it is interpreted as representing whether or not test items measure a single attribute. The normal range for values of Cronbach's alpha reliability coefficient is from 0 to 1, with internal consistency (reliability) increasing as values approach 1. An interpretation of Cronbach's alpha reliability coefficient is provided by George and Mallery (as cited in Gliem & Gliem, 2003, p. 87). Table 4 summarizes their interpretation:

Table 4
Ratings of Instrument Reliability Based on Cronbach's Alpha
(George & Mallery, as cited in Gliem & Gliem, 2003, p. 87)

Rating	Interval Values for Cronbach's Alpha Reliability Coefficient
Excellent	(0.9, 1]
Good	(0.8, 0.9]
Acceptable	(0.7, 0.8]
Questionable	(0.6, 0.7]
Poor	(0.5, 0.6]
Unacceptable	[0.0, 0.5]

In addition to Cronbach's alpha, the Smith-Brown prophecy coefficient was determined for each of the seven subscales of the IPI. The Smith-Brown coefficient is an adjusted reliability index which controls for test length.

A factor analysis can aid in the interpretation of Cronbach's alpha. A factor analysis determines the degree of correlation among items under consideration. Comrey and Lee (as cited in Tabachnik & Fidell, 2001, p. 588) provide a guide for sample size when conducting a factor analysis, "As a general rule of thumb, it is comfortable to have at least 300 cases for a factor analysis" (p. 588). Due to the sample size for this study, a factor analysis was not conducted.

Population

The population for this study was 145 full-time mathematics faculty employed by the member colleges of the Missouri Community College Association. Each participant is a subscriber to the newsletter of the Missouri Mathematics Association for Two-Year Colleges (MOMATYC). Participants were contacted by electronic mail (e-mail) and invited to participate. The e-mail included a direct link to the online survey tool (*Flashlight*™), which was used to administer the survey, as described in the Data Collection section of this chapter.

Data Collection

The questionnaire (survey) for this study (Appendix C) consisted of the 45 items of the Instructional Perspectives Inventory (IPI) and response choices for demographic information regarding gender, age range, racial and ethnic group, highest earned degree, academic rank, teaching experience, and adult education courses completed. The choices for demographic information categories were based on Conti's (1985b) contention that teaching style is influenced by educational philosophy, additional academic training, the age of the teacher, and experiential background. Questions about teaching experience included the total number of years of teaching experience and the total number of years served as a full-time mathematics faculty member at the community college.

Participants were introduced to the study through a paragraph in the electronic newsletter of the Missouri Mathematics Association of Two Year Colleges (MOMATYC), *Rational Expressions*. Participants were then contacted by electronic mail (e-mail) (Appendix D). The e-mail included a direct link to the online survey tool (*Flashlight*™) for this study. All participants were presented with the same version of

the questionnaire electronically. The electronic platform for the questionnaire supports privacy of participation and anonymity for participants. It was expected that a reminder e-mail would be sent to all participants after two weeks.

An initial check of the survey was conducted to determine whether or not participants were responding and to view possible data analysis results available within the *Flashlight*™ program. This check revealed that some participants had completed the survey. Shortly after this check, this researcher began to receive electronic mail (e-mail) and telephone correspondence which indicated that participants were receiving a computer-generated error message that their responses could not be submitted. After consultation with the faculty member at the University of Missouri – St. Louis (UMSL) who coordinates access and use of the *Flashlight*™ program, it was determined that there could be some software compatibility issues. These software issues were most likely a result of the recent release of the next generation of faculty members' respective e-mail platforms, internet platforms, and the *Flashlight*™ program. A second e-mail was immediately sent alerting participants to the nature of this problem and suggesting a remedy for this problem (Appendix D). This software issue may have contributed to nonresponse bias for this study.

Data Analysis

The survey responses were encoded through the online survey program *Flashlight*™. The raw form of data from this program includes item responses for all participants. Data were grouped for scoring as described in Table 5.

Table 5
Data Groupings for Scoring the IPI

Factor Number	Factor Description	Question Numbers
1	Teacher empathy with learners.	4, 12, 19, 26, 33
2	Teacher trust of learners.	7, 8, 16, 28, 29, 30, 31, 39, 43, 44, 45
3	Planning and delivery of instruction.	1, 9, 22, 23, 42
4	Accommodating learner uniqueness.	6, 14, 15, 17, 37, 38, 40
5*	Teacher insensitivity toward learners.	5, 13, 18, 27, 32, 36, 41
6	Experience-based learning techniques (learner-centered learning process).	2, 10, 21, 24, 35
7*	Teacher-centered learning process.	3, 11, 20, 25, 34

*Item responses are reverse-scored for the questions included in this factor.

Each factor of the IPI will be designated as a subscale. Subscale items are identified in Table 5.

Data from the results of this study were analyzed using the statistical software *SPSS*™ 14.0. Statistical significance for this study is set at $p < 0.05$. The following statistical analyses were performed and results are reported in Chapter four: descriptive statistics for demographic categories; descriptive statistics for summative subscale scores and summative overall IPI scores; an Analysis of Variance (ANOVA) on summative overall IPI scores by demographic categories with a Tukey Post Hoc Test where appropriate; an ANOVA on question scores by demographic categories with a Tukey Post Hoc Test where appropriate; a calculation of Cronbach's alpha reliability coefficient and the Smith-Brown prophecy coefficient for all subscale summative scores. A mean replacement was used for missing response items for the 45 questions of the IPI. For cases where an adequate cell sample size was available, an additional ANOVA was conducted to determine interaction effects.

Ethical Issues

Creswell (2003) considers ethical issues to anticipate when designing and implementing a research study: the research problem should benefit the individuals being studied; the purpose of the study must be described to the participants; data collection methods must not put participants at risk and the privacy of participants must be protected; anonymity of participants must be preserved during data analysis and interpretation; and results must not be misused, nor may findings be falsified.

Ethical issues were addressed in the design of this study. This study was conducted after receiving approval (Appendix E) from the Institutional Research Board (IRB) at the University of Missouri – St. Louis (UMSL). This study will benefit participants by informing their practice through consideration and reflection on the 45 questions of the Instructional Perspectives Inventory (IPI) (Henschke, 1989a, 1989b). The purpose of this study was described to participants in introductory e-mails (Appendix D) and in the consent form for this study. The consent form for this study is embedded in the online survey form (Appendix C). Participants were reminded of the voluntary nature of this study through the consent form for this study. Anonymity of participants is preserved through the nature of the online survey program used for this study (*Flashlight*™). When reporting scores, subscale summative scores will only be reported for groups of at least two participants. The consent form section of the online survey included not only the consent number assigned to this study, but also information regarding ways to contact the Institutional Research Board (IRB) of the University of Missouri - St. Louis (UMSL). In addition, through e-mail correspondence (Appendix D) and the consent form for this survey, participants were presented with information regarding how to contact the

researcher by telephone and e-mail.

Chapter Summary

This chapter describes the methodology for this study. After consideration of multiple instruments from the research literature of adult education, the Instructional Perspectives Inventory (IPI) designed by Henschke (1989) and modified by Stanton (2005) was selected as the instrument for this study. The population for this study is 145 full-time mathematics faculty members employed by the member colleges of the Missouri Community College Association. The IPI was administered through the online survey tool *Flashlight*™. Ethical issues were addressed in the design of this study.

Statistical analyses performed include: descriptive statistics for demographic categories; descriptive statistics for summative subscale scores and summative overall IPI scores; an Analysis of Variance (ANOVA) on summative subscale scores and summative overall IPI scores by demographic categories with a Tukey Post Hoc Test where appropriate; an ANOVA on question scores by demographic categories with a Tukey Post Hoc Test where appropriate; a calculation of Cronbach's alpha reliability coefficient and the Smith-Brown prophecy coefficient for all summative subscale scores. A mean replacement was used for missing response items for the 45 questions of the IPI. For cases where an adequate cell sample size was available, an additional ANOVA was conducted to determine interaction effects. All statistical analyses were performed using the statistical software *SPSS*™.

In the following chapters, the results of this study will be reported, interpreted, and discussed. Chapter four includes a report of the results of statistical analyses performed to address the research questions for this study. Chapter five provides a summary and

discussion of the findings from this study, including recommendations for future studies with the Instructional Perspectives Inventory (IPI).

Chapter 4: Report of Findings

This chapter provides reports of the findings for this study. Categories of demographic variables and demographic characteristics of participants are described in terms of both numbers and percentages of respondents. The mean, standard deviation, and standard error are reported for summative subscale scores and summative overall Instructional Perspectives Inventory (IPI) scores for the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member. The report of statistics conducted will not include the demographic categories of "race or ethnic origin" due to group size or "adult education courses taken" due to the low response rate for that question.

This chapter includes a report of the findings from Analyses of Variance (ANOVA's) conducted on summative subscale scores and summative overall IPI scores. Statistical significance for this study is set at the $p < 0.05$ level. Results of Tukey Post Hoc Tests are reported for demographic categories with more than two groups. F values and statistical significance values are reported for interaction effects. F values and statistical significance values are reported for the questions of the IPI. Statistically significant ANOVA results for interaction effects and for the questions of the IPI are reported in Appendix F of this study. In addition, this chapter includes a report of the findings from a calculation of Cronbach's alpha reliability coefficient and Spearman-Brown prophecy coefficient for all subscales of the IPI.

Purpose of the Study

The intention of this study is to provide a descriptive analysis of the beliefs, feelings,

and behaviors of full-time mathematics faculty at the community college, using the Instructional Perspectives Inventory (IPI). In addition, the reliability of the IPI for this population will be considered. This study contributes to the empirical base of the research literature of adult education by its nature – the use of an instrument that measures beliefs, feelings, and behaviors of adult educators with a population of mathematics faculty from the community college - and will contribute to a bridging of the research gap that exists between mathematics education and adult education.

Population

The population for this study was 145 mathematics faculty members at community colleges that are members of the Missouri Community College Association. Thirty-four full-time mathematics faculty members were respondents to the online survey questionnaire for this study. This is a response rate of 23.4%.

Demographic Characteristics of Participants

In addition to the 45 items of the Instructional Perspectives Inventory (IPI), participants were asked to respond to questions that determined the following demographic characteristics: gender, age range, racial and ethnic group, highest degree attained, academic rank, total years of teaching experience, total number of years of service as a full-time faculty member at a community college, and adult education courses completed by participants. A report of these responses is provided in the following sections.

Gender

Twenty-five females and eight males participated in this study. There was one non-response for this category. Mean replacement was not used for this missing response due

to the nature of this category. Thus, the population of participants for this study is 73.5% female and 23.5% male.

Age Range

The responses for age range are summarized in Table 6.

Table 6
Number of Responses by Age Range

Age Range	Number of Responses	Percent of Total Respondents
Under 35	2	5.9
35-44	8	23.5
45-54	7	20.6
55-64	16	47.1
65-70	1	2.9
71 or older	0	0

Racial or Ethnic Group

The categories for racial or ethnic group were: White, non-Hispanic; Black, non-Hispanic; Asian; Hispanic; and Other. Thirty-two participants responded that they were "White, non-Hispanic" and one participant responded "Other". Mean replacement was not used due to the nature of this category. Thus, 94.1% of participants consider themselves to be "White, non-Hispanic" and 2.9% of participants do not consider themselves to be "White, non-Hispanic".

Highest Degree Attained

Although the minimum academic qualification for full-time mathematics faculty status at most community colleges is a Master's degree, "Bachelor's or less" was included as a response category for this item. As expected, this category received a zero percent response. Three of the participants reported a "Doctorate or professional" degree and 31

of the participants reported having "Master's" as the highest degree attained. Thus, 8.8% of respondents have earned a doctorate or other professional degree and 91.2% have earned a Master's degree.

Academic Rank

The results for responses to this category are summarized in Table 7.

Table 7
Number of Responses by Academic Rank

Academic Rank	Number of Responses	Percent of Total Respondents
Full Professor	15	0.44
Associate Professor	3	0.08
Assistant Professor	5	0.15
Instructor or Lecturer	5	0.15
Other or not applicable	6	0.18

Total Years of Teaching Experience

This item was a "free response" item. Responses ranged from a minimum value of 4 years to a maximum value of 42 years. Mean replacement was exercised for this category of responses. The mean (μ) for this category was 21.03, the standard deviation (σ) was 8.42, the standard error (S.E.) was 1.47. Due to the specificity of this item, it was necessary to design groups in such a fashion as to ensure distinct groups. The boundary region for the "middle" group was set for values within one-half standard deviation (σ) of the mean (μ). Values within one standard error (S.E.) of this region were excluded. The mathematical calculations for these groupings are included in Table 8.

Table 8
Groupings for Total Years of Teaching Experience

Group	Range	n	Description of calculation for grouping
1	0-15	10	All values less than or equal to $\mu - \frac{1}{2}\sigma - S.E.$
2	17-25	14	Values between $\mu - \frac{1}{2}\sigma$ and $\mu + \frac{1}{2}\sigma$
3	27 and over	10	Values greater than or equal to $\mu + \frac{1}{2}\sigma + S.E.$

Total Years of Service as a Full-Time Faculty Member at a Community College

This item was a "free response" category. Responses ranged from "less than a year" which was coded as 0.5 to a maximum value of 27. Mean replacement was exercised for this category of responses. The mean (μ) for this category was 13.26, the standard deviation (σ) was 7.95, and the standard error (S.E.) was 1.38. Due to the specificity of this item, it was necessary to design groups in such a fashion as to ensure distinct groups when analyzing variance. The boundary region for the "middle" group was set for values within one-half standard deviation (σ) of the mean (μ). Values within one standard error (S.E.) of this region were excluded. The mathematical calculations for these groupings are included in Table 9.

Table 9
Groupings for Total Years as a Full-Time Faculty Member at a Community College

Group	Range	n	Description of calculation for grouping
1	Less than 9 years	14	All values less than or equal to $\mu - \frac{1}{2}\sigma - S.E.$
2	Between 9 and 17 years, inclusive	8	Values between $\mu - \frac{1}{2}\sigma$ and $\mu + \frac{1}{2}\sigma$
3	19 and above	10	Values greater than or equal to $\mu + \frac{1}{2}\sigma + S.E.$

Adult Education Courses Completed by Participants

This item was a "free response" category. Nearly half (15) of the participants for this study did not respond to this item. The question was "Please describe any graduate courses that you may have taken in Adult Education". It is assumed that the lack of responses was due to the possible ambiguity or lack of clarity of this question. As will be mentioned in Chapter five, a recommendation for future research studies would be to reconsider the statement of this question.

Research Question One

The first research question for this study is "What are the instructional perspectives of mathematics faculty at the community college?" This section includes reports from the various statistical analyses conducted to assist in addressing the first research question for this study. Findings are organized by subscale for a report of summative overall scores for groups within the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member. Statistically significant results from Analyses of

Variance (ANOVA's) are reported by demographic category. The report of statistics conducted to assist in addressing this research question will not include the demographic categories of "race or ethnic origin" due to group size or "adult education courses taken" due to the low response rate for that question. Table 10 presents the mean, standard deviation, and standard error for summative subscale scores and summative overall IPI scores for all participants.

Table 10
Summative Overall IPI Scores

Subscale	n	Min*	Max**	Mean	Standard Deviation	Standard Error
1	34	5	25	19.91	2.54	0.44
2	34	11	55	40.32	5.00	0.86
3	34	5	25	18.82	2.71	0.47
4	34	7	35	24.73	3.25	0.56
5	34	7	35	25.18	3.55	0.61
6	34	5	25	10.54	3.26	0.56
7	34	5	25	14.17	2.60	0.45
Total (all)	34	45	225	153.68	15.85	2.72

*Possible minimum summative score.

**Possible maximum summative score.

Subscale One: Teacher Empathy with Learners (Teacher Empathy)

The minimum possible summative score for this subscale is 5, the maximum possible summative score for this subscale is 25. Values for the mean, standard deviation, and standard error are reported for groups within each of the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member.

Gender

The demographic category of gender includes two groups. Summative subscale

scores for these groups are reported in Table 11.

Table 11
Subscale One (Teacher Empathy with Learners) Summative Scores for Groups by Gender

Group	Gender	n	Mean	Standard Deviation	Standard Error
1	Females	25	20.68	2.06	0.42
2	Males	8	18.00	2.73	0.96
All	Females & Males	33	20.03	2.48	0.43

Age

The demographic category of age includes six groups. Summative subscale scores for these groups are reported in Table 12. Scores for group 5 (ages 65-70) and group 6 (ages 71 and over) will not be reported due to group size.

Table 12
Subscale One (Teacher Empathy with Learners) Summative Scores for Groups by Age Range

Group	Age Range	n	Mean	Standard Deviation	Standard Error
1	Under 35	2	16.50	3.54	2.50
2	35-44	8	20.25	1.67	0.59
3	45-54	7	19.57	2.07	0.78
4	55-64	16	20.13	2.83	0.71
All	All	34	19.91	2.54	0.44

Highest Degree Attained

The demographic category of highest degree attained includes responses for two groups. Summative subscale scores for these groups are reported in Table 13.

Table 13
Subscale One (Teacher Empathy with Learners) Summative Scores for Groups by Highest Degree Attained

Group	Degree	n	Mean	Standard Deviation	Standard Error
1	Doctorate or Professional	3	22.67	1.15	0.67
2	Master's	31	19.65	2.48	0.45
All	Either	34	19.91	2.54	0.44

Academic Rank

The demographic category of academic rank includes five groups. Summative subscale scores for these groups are reported in Table 14.

Table 14
Subscale One (Teacher Empathy with Learners) Summative Scores for Groups by Academic Rank

Group	Academic Rank	n	Mean	Standard Deviation	Standard Error
1	Full Professor	15	20.13	2.80	0.72
2	Associate Professor	3	18.67	2.08	1.20
3	Assistant Professor	5	20.20	3.83	1.71
4	Instructor or Lecturer	5	19.40	2.07	0.93
5	Other or not applicable	6	20.17	1.47	0.60
All	All academic ranks	34	19.91	2.54	0.44

Total Years of Teaching Experience

The demographic category of total years of teaching experience includes three groups. Summative subscale scores for these groups are reported in Table 15.

Table 15
Subscale One (Teacher Empathy with Learners) Summative Scores for Groups by Total Years of Teaching Experience

Group	Range of Experience	n	Mean	Standard Deviation	Standard Error
1	0-15	10	20.10	2.81	0.88
2	17-25	14	20.14	1.99	0.53
3	27 and over	10	19.40	3.10	0.98
All	All ranges	34	19.91	2.54	0.44

Total Years of Service as a Full-Time Community College Faculty Member

The demographic category of total years of service as a full-time community college faculty member includes three groups. Summative subscale scores for these groups are reported in Table 16.

Table 16
Subscale One (Teacher Empathy with Learners) Summative Scores for Groups by Total Years of Service as a Full-Time Community College Faculty Member

Group	Range of Service Years	n	Mean	Standard Deviation	Standard Error
1	Less than 9 years	14	20.64	2.62	0.70
2	Between 9 and 17 years, inclusive	8	20.00	1.51	0.53
3	19 and above	10	19.30	3.06	0.97
All	Any length of service	34	19.91	2.54	0.44

Subscale Two: Teacher Trust of Learners

The minimum possible summative score for this subscale is 11; the maximum possible summative score for this subscale is 55. Values for the mean, standard deviation, and standard error are reported for groups within each of the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member.

Gender

The demographic category of gender includes two groups. Summative subscale scores for these groups are reported in Table 17.

Table 17
Subscale Two (Teacher Trust of Learners) Summative Scores for Groups by Gender

Group	Gender	n	Mean	Standard Deviation	Standard Error
1	Females	25	41.96	4.26	0.85
2	Males	8	35.72	4.36	1.54
All	Females & Males	33	40.45	5.02	0.87

Age

The demographic category of age includes six groups. Summative subscale scores for these groups are reported in Table 18. Scores for group 5 (ages 65-70) and group 6 (ages 71 and over) will not be reported due to group size.

Table 18
Subscale Two (Teacher Trust of Learners) Summative Scores for Groups by Age Range

Group	Age Range	n	Mean	Standard Deviation	Standard Error
1	Under 35	2	30.50	2.12	1.50
2	35-44	8	39.25	3.62	1.28
3	45-54	7	39.14	4.26	1.61
4	55-64	16	42.36	4.67	1.17
All	All ranges	34	40.32	5.00	0.86

Highest Degree Attained

The demographic category of highest degree attained includes responses for two groups. Summative subscale scores for these groups are reported in Table 19.

Table 19
Subscale Two (Teacher Trust of Learners) Summative Scores for Groups by Highest Degree Attained

Group	Degree	n	Mean	Standard Deviation	Standard Error
1	Doctorate or Professional	3	45.18	3.73	2.15
2	Master's	31	39.85	4.89	0.88
All	Either	34	40.32	5.00	0.86

Academic Rank

The demographic category of academic rank includes five groups. Summative subscale scores for these groups are reported in Table 20.

Table 20
Subscale Two (Teacher Trust of Learners) Summative Scores for Groups by Academic Rank

Group	Academic Rank	n	Mean	Standard Deviation	Standard Error
1	Full Professor	15	40.99	4.98	1.29
2	Associate Professor	3	37.33	2.08	1.20
3	Assistant Professor	5	40.98	7.59	3.40
4	Instructor or Lecturer	5	39.01	5.38	2.40
5	Other or not applicable	6	40.67	3.93	1.61
All	All academic ranks	34	40.32	5.00	0.86

Total Years of Teaching Experience

The demographic category of total years of teaching experience includes three groups. Summative subscale scores for these groups are reported in Table 21.

Table 21
Subscale Two (Teacher Trust of Learners) Summative Scores for Groups by Total Years of Teaching Experience

Group	Range of Experience	n	Mean	Standard Deviation	Standard Error
1	0-15	10	40.10	6.06	1.92
2	17-25	14	39.88	4.70	1.26
3	27 and over	10	41.14	4.66	1.47
All	All ranges	34	40.32	5.00	0.86

Total Years of Service as a Full-Time Community College Faculty Member

The demographic category of total years of service as a full-time community college faculty member includes three groups. Summative subscale scores for these groups are reported in Table 22.

Table 22
Subscale Two (Teacher Trust of Learners) Summative Scores for Groups by Total Years of Service as a Full-Time Community College Faculty Member

Group	Range of Service Years	n	Mean	Standard Deviation	Standard Error
1	Less than 9 years	14	41.92	5.98	1.60
2	Between 9 and 17 years, inclusive	8	37.38	3.03	1.07
3	19 and above	10	40.64	4.34	1.37
All	Any length of service	34	40.32	5.00	0.86

Subscale Three: Planning and Delivery of Instruction

The minimum possible summative score for this subscale is 5; the maximum possible summative score for this subscale is 25. Values for the mean, standard deviation, and standard error are reported for groups within each of the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member

Gender

The demographic category of gender includes two groups. Summative subscale scores for these groups are reported in Table 23.

Table 23
Subscale Three (Planning and Delivery of Instruction) Summative Scores for Groups by Gender

Group	Gender	n	Mean	Standard Deviation	Standard Error
1	Females	25	19.40	2.86	0.57
2	Males	8	17.25	1.49	0.53
All	Females & Males	33	18.88	2.74	0.48

Age

The demographic category of age includes six groups. Summative subscale scores for these groups are reported in Table 24. Scores for group 5 (ages 65-70) and group 6 (ages 71 and over) will not be reported due to group size.

Table 24
Subscale Three (Planning and Delivery of Instruction) Summative Scores for Groups by Age Range

Group	Age Range	n	Mean	Standard Deviation	Standard Error
1	Under 35	2	15.50	0.71	0.50
2	35-44	8	18.50	2.62	0.93
3	45-54	7	18.15	3.33	1.26
4	55-64	16	19.56	2.42	0.61
All	All age ranges	34	18.82	2.71	0.47

Highest Degree Attained

The demographic category of highest degree attained includes responses for two groups. Summative subscale scores for these groups are reported in Table 25.

Table 25
Subscale Three (Planning and Delivery of Instruction) Summative Scores for Groups by Highest Degree Attained

Group	Degree	n	Mean	Standard Deviation	Standard Error
1	Doctorate or Professional	3	19.67	3.21	1.86
2	Master's	31	18.74	2.71	0.49
All	Either	34	18.82	2.71	0.47

Academic Rank

The demographic category of academic rank includes five groups. Summative subscale scores for these groups are reported in Table 26.

Table 26
Subscale Three (Planning and Delivery of Instruction) Summative Scores for Groups by Academic Rank

Group	Academic Rank	n	Mean	Standard Deviation	Standard Error
1	Full Professor	15	17.99	2.45	0.63
2	Associate Professor	3	19.00	1.00	0.58
3	Assistant Professor	5	18.80	3.96	1.77
4	Instructor or Lecturer	5	19.21	3.10	1.39
5	Other or not applicable	6	20.50	2.35	0.96
All	All academic ranks	34	18.82	2.71	0.47

Total Years of Teaching Experience

The demographic category of total years of teaching experience includes three groups. Summative subscale scores for these groups are reported in Table 27.

Table 27
Subscale Three (Planning and Delivery of Instruction) Summative Scores for Groups by Total Years of Teaching Experience

Group	Range of Experience	n	Mean	Standard Deviation	Standard Error
1	0-15	10	17.90	2.69	0.85
2	17-25	14	18.64	2.59	0.69
3	27 and over	10	20.00	2.75	0.87
All	All ranges	34	18.82	2.71	0.47

Total Years of Service as a Full-Time Community College Faculty Member

The demographic category of total years of service as a full-time community college faculty member includes three groups. Summative subscale scores for these groups are reported in Table 28.

Table 28
Subscale Three (Planning and Delivery of Instruction) Summative Scores for Groups by Total Years of Service as a Full-Time Community College Faculty Member

Group	Range of Service Years	n	Mean	Standard Deviation	Standard Error
1	Less than 9 years	14	18.43	3.11	0.83
2	Between 9 and 17 years, inclusive	8	19.00	2.07	0.73
3	19 and above	10	19.80	2.57	0.81
All	Any length of service	34	18.82	2.71	0.47

Subscale Four: Accommodating Learner Uniqueness

The minimum possible summative score for this subscale is 7; the maximum possible summative score for this subscale is 35. Values for the mean, standard deviation, and standard error are reported for groups within each of the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member.

Gender

The demographic category of gender includes two groups. Summative subscale scores for these groups are reported in Table 29.

Table 29
Subscale Four (Accommodating Learner Uniqueness) Summative Scores for Groups by Gender

Group	Gender	n	Mean	Standard Deviation	Standard Error
1	Females	25	25.63	2.90	0.58
2	Males	8	22.77	2.67	0.94
All	Females & Males	33	24.94	3.07	0.53

Age

The demographic category of age includes six groups. Summative subscale scores for these groups are reported in Table 30. Scores for group 5 (ages 65-70) and group 6 (ages 71 and over) will not be reported due to group size.

Table 30
Subscale Four (Accommodating Learner Uniqueness) Summative Scores for Groups by Age Range

Group	Age Range	n	Mean	Standard Deviation	Standard Error
1	Under 35	2	20.00	2.83	2.00
2	35-44	8	24.25	2.19	0.77
3	45-54	7	23.57	3.51	1.33
4	55-64	16	25.69	2.87	0.72
All	All age ranges	34	24.73	3.25	0.56

Highest Degree Attained

The demographic category of highest degree attained includes responses for two groups. Summative subscale scores for these groups are reported in Table 31.

Table 31
Subscale Four (Accommodating Learner Uniqueness) Summative Scores for Groups by Highest Degree Attained

Group	Degree	n	Mean	Standard Deviation	Standard Error
1	Doctorate or Professional	3	24.67	1.15	0.67
2	Master's	31	24.74	3.40	0.61
All	Either	34	24.73	3.25	0.56

Academic Rank

The demographic category of academic rank includes five groups. Summative subscale scores for these groups are reported in Table 32.

Table 32
Subscale Four (Accommodating Learner Uniqueness) Summative Scores for Groups by Academic Rank

Group	Academic Rank	n	Mean	Standard Deviation	Standard Error
1	Full Professor	15	24.73	2.81	0.73
2	Associate Professor	3	23.00	3.61	2.08
3	Assistant Professor	5	24.60	4.98	2.23
4	Instructor or Lecturer	5	23.60	4.16	1.86
5	Other or not applicable	6	26.69	1.06	0.43
All	All academic ranks	34	24.73	3.25	0.56

Total Years of Teaching Experience

The demographic category of total years of teaching experience includes three groups. Summative subscale scores for these groups are reported in Table 33.

Table 33
Subscale Four (Accommodating Learner Uniqueness) Summative Scores for Groups by Total Years of Teaching Experience

Group	Range of Experience	n	Mean	Standard Deviation	Standard Error
1	0-15	10	24.00	3.23	1.02
2	17-25	14	25.00	2.80	0.75
3	27 and over	10	25.10	4.01	1.27
All	All ranges	34	24.73	3.25	0.56

Total Years of Service as a Full-Time Community College Faculty Member

The demographic category of total years of service as a full-time community college faculty member includes three groups. Summative subscale scores for these groups are reported in Table 34.

Table 34
Subscale Four (Accommodating Learner Uniqueness) Summative Scores for Groups by Total Years of Service as a Full-Time Community College Faculty Member

Group	Range of Service Years	n	Mean	Standard Deviation	Standard Error
1	Less than 9 years	14	25.43	3.61	0.96
2	Between 9 and 17 years, inclusive	8	24.13	2.23	0.79
3	19 and above	10	24.60	3.78	1.19
All	Any length of service	34	24.73	3.25	0.56

Subscale Five: Teacher Insensitivity Toward Learners

The minimum possible summative score for this subscale is 7; the maximum possible summative score for this subscale is 35. Values for the mean, standard deviation, and standard error are reported for groups within each of the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member.

Gender

The demographic category of gender includes two groups. Summative subscale scores for these groups are reported in Table 35.

Table 35
Subscale Five (Teacher Insensitivity Toward Learners) Summative Scores for Groups by Gender

Group	Gender	n	Mean	Standard Deviation	Standard Error
1	Females	25	25.36	3.90	0.78
2	Males	8	25.25	1.83	0.65
All	Females & Males	33	25.33	3.49	0.61

Age

The demographic category of age includes six groups. Summative subscale scores for these groups are reported in Table 36. Scores for group 5 (ages 65-70) and group 6 (ages 71 and over) will not be reported due to group size.

Table 36
Subscale Five (Teacher Insensitivity Toward Learners) Summative Scores for Groups by Age Range

Group	Age Range	n	Mean	Standard Deviation	Standard Error
1	Under 35	2	27.50	0.71	0.50
2	35-44	8	24.38	3.38	1.19
3	45-54	7	22.29	1.38	0.52
4	55-64	16	26.38	3.83	0.96
All	All age ranges	34	25.18	3.55	0.61

Highest Degree Attained

The demographic category of highest degree attained includes responses for two groups. Summative subscale scores for these groups are reported in Table 37.

Table 37
Subscale Five (Teacher Insensitivity Toward Learners) Summative Scores for Groups by Highest Degree Attained

Group	Degree	n	Mean	Standard Deviation	Standard Error
1	Doctorate or Professional	3	30.67	3.51	2.03
2	Master's	31	24.65	3.13	0.56
All	Either	34	25.18	3.55	0.61

Academic Rank

The demographic category of academic rank includes five groups. Summative subscale scores for these groups are reported in Table 38.

Table 38
Subscale Five (Teacher Insensitivity Toward Learners) Summative Scores for Groups by Academic Rank

Group	Academic Rank	n	Mean	Standard Deviation	Standard Error
1	Full Professor	15	26.33	3.75	0.97
2	Associate Professor	3	21.67	3.21	1.86
3	Assistant Professor	5	26.40	2.07	0.93
4	Instructor or Lecturer	5	23.20	2.59	1.16
5	Other or not applicable	6	24.67	3.72	1.52
All	All academic ranks	34	25.18	3.55	0.61

Total Years of Teaching Experience

The demographic category of total years of teaching experience includes three groups. Summative subscale scores for these groups are reported in Table 39.

Table 39
Subscale Five (Teacher Insensitivity Toward Learners) Summative Scores for Groups by Total Years of Teaching Experience

Group	Range of Experience	n	Mean	Standard Deviation	Standard Error
1	0-15	10	26.60	3.31	1.05
2	17-25	14	23.86	2.85	0.76
3	27 and over	10	25.60	4.30	1.36
All	All ranges	34	25.18	3.55	0.61

Total Years of Service as a Full-Time Community College Faculty Member

The demographic category of total years of service as a full-time community college faculty member includes three groups. Summative subscale scores for these groups are reported in Table 40.

Table 40
Subscale Five (Teacher Insensitivity Toward Learners) Summative Scores for Groups by Total Years of Service as a Full-Time Community College Faculty Member

Group	Range of Service Years	n	Mean	Standard Deviation	Standard Error
1	Less than 9 years	14	26.43	2.85	0.76
2	Between 9 and 17 years, inclusive	8	22.25	2.12	0.75
3	19 and above	10	26.10	4.25	1.35
All	Any length of service	34	25.18	3.55	0.61

Subscale Six: Experience-Based Learning Techniques

The minimum possible summative score for this subscale is 5, the maximum possible summative score for this subscale is 25. Values for the mean, standard deviation, and standard error are reported for groups within each of the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member.

Gender

The demographic category of gender includes two groups. Summative subscale scores for these groups are reported in Table 41.

Table 41
Subscale Six (Experience-Based Learning Techniques) Summative Scores for Groups by Gender

Group	Gender	n	Mean	Standard Deviation	Standard Error
1	Females	25	11.26	3.12	0.62
2	Males	8	9.00	2.78	0.98
All	Females & Males	33	10.71	3.15	0.55

Age

The demographic category of age includes six groups. Summative subscale scores for these groups are reported in Table 42. Scores for group 5 (ages 65-70) and group 6 (ages 71 and over) will not be reported due to group size.

Table 42
Subscale Six (Experience-Based Learning Techniques) Summative Scores for Groups by Age Range

Group	Age Range	n	Mean	Standard Deviation	Standard Error
1	Under 35	2	6.00	1.41	1.00
2	35-44	8	10.13	3.64	1.29
3	45-54	7	10.43	3.55	1.34
4	55-64	16	11.40	2.88	0.72
All	All age ranges	34	10.54	3.26	0.56

Highest Degree Attained

The demographic category of highest degree attained includes responses for two groups. Summative subscale scores for these groups are reported in Table 43.

Table 43
Subscale Six (Experience-Based Learning Techniques) Summative Scores for Groups by Highest Degree Attained

Group	Degree	n	Mean	Standard Deviation	Standard Error
1	Doctorate or Professional	3	11.33	6.51	3.76
2	Master's	31	10.47	2.96	0.53
All	Either	34	10.54	3.26	0.56

Academic Rank

The demographic category of academic rank includes five groups. Summative subscale scores for these groups are reported in Table 44.

Table 44
Subscale Six (Experience-Based Learning Techniques) Summative Scores for Groups by Academic Rank

Group	Academic Rank	n	Mean	Standard Deviation	Standard Error
1	Full Professor	15	9.70	2.32	0.60
2	Associate Professor	3	10.33	2.08	1.20
3	Assistant Professor	5	12.20	5.81	2.60
4	Instructor or Lecturer	5	10.20	4.09	1.83
5	Other or not applicable	6	11.67	2.50	1.02
All	All academic ranks	34	10.54	3.26	0.56

Total Years of Teaching Experience

The demographic category of total years of teaching experience includes three groups. Summative subscale scores for these groups are reported in Table 45.

Table 45
Subscale Six (Experience-Based Learning Techniques) Summative Scores for Groups by Total Years of Teaching Experience

Group	Range of Experience	n	Mean	Standard Deviation	Standard Error
1	0-15	10	10.10	4.01	1.27
2	17-25	14	10.50	2.47	0.66
3	27 and over	10	11.05	3.67	1.16
All	All ranges	34	10.54	3.26	0.56

Total Years of Service as a Full-Time Community College Faculty Member

The demographic category of total years of service as a full-time community college faculty member includes three groups. Summative subscale scores for these groups are reported in Table 46.

Table 46
Subscale Six (Experience-Based Learning Techniques) Summative Scores for Groups by Total Years of Service as a Full-Time Community College Faculty Member

Group	Range of Service Years	n	Mean	Standard Deviation	Standard Error
1	Less than 9 years	14	10.57	4.01	1.07
2	Between 9 and 17 years, inclusive	8	10.75	1.83	0.65
3	19 and above	10	10.65	3.40	1.07
All	Any length of service	34	10.54	3.26	0.56

Subscale Seven: Teacher-Centered Learning Process

The minimum possible summative score for this subscale is 5; the maximum possible summative score for this subscale is 25. Values for the mean, standard deviation, and standard error are reported for groups within each of the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member.

Gender

The demographic category of gender includes two groups. Summative subscale scores for these groups are reported in Table 47.

Table 47
Subscale Seven (Teacher-Centered Learning Process) Summative Scores for Groups by Gender

Group	Gender	n	Mean	Standard Deviation	Standard Error
1	Females	25	14.56	2.42	0.48
2	Males	8	13.63	2.62	0.92
All	Females & Males	33	14.33	2.45	0.43

Age

The demographic category of age includes six groups. Summative subscale scores for these groups are reported in Table 48. Scores for group 5 (ages 65-70) and group 6 (ages 71 and over) will not be reported due to group size.

Table 48
Subscale Seven (Teacher-Centered Learning Process) Summative Scores for Groups by Age Range

Group	Age Range	n	Mean	Standard Deviation	Standard Error
1	Under 35	2	12.00	0.00	0.00
2	35-44	8	13.75	2.19	0.77
3	45-54	7	13.97	3.10	1.17
4	55-64	16	14.81	2.74	0.68
All	All age ranges	34	14.17	2.60	0.45

Highest Degree Attained

The demographic category of highest degree attained includes responses for two groups. Summative subscale scores for these groups are reported in Table 49.

Table 49
Subscale Seven (Teacher-Centered Learning Process) Summative Scores for Groups by Highest Degree Attained

Group	Degree	n	Mean	Standard Deviation	Standard Error
1	Doctorate or Professional	3	12.67	1.53	0.88
2	Master's	31	14.32	2.65	0.48
All	Either	34	14.17	2.60	0.45

Academic Rank

The demographic category of academic rank includes five groups. Summative subscale scores for these groups are reported in Table 50.

Table 50
Subscale Seven (Teacher-Centered Learning Process) Summative Scores for Groups by Academic Rank

Group	Academic Rank	n	Mean	Standard Deviation	Standard Error
1	Full Professor	15	14.27	2.55	0.66
2	Associate Professor	3	13.67	4.04	2.33
3	Assistant Professor	5	14.60	2.19	0.98
4	Instructor or Lecturer	5	13.56	3.84	1.72
5	Other or not applicable	6	14.33	1.86	0.76
All	All academic ranks	34	14.17	2.60	0.45

Total Years of Teaching Experience

The demographic category of total years of teaching experience includes three groups. Summative subscale scores for these groups are reported in Table 51.

Table 51
Subscale Seven (Teacher-Centered Learning Process) Summative Scores for Groups by Total Years of Teaching Experience

Group	Range of Experience	n	Mean	Standard Deviation	Standard Error
1	0-15	10	13.30	1.25	0.40
2	17-25	14	14.93	2.73	0.73
3	27 and over	10	13.98	3.26	1.03
All	All ranges	34	14.17	2.60	0.45

Total Years of Service as a Full-Time Community College Faculty Member

The demographic category of total years of service as a full-time community college faculty member includes three groups. Summative subscale scores for these groups are reported in Table 52.

Table 52
Subscale Seven (Teacher-Centered Learning Process) Summative Scores for Groups by Total Years of Service as a Full-Time Community College Faculty Member

Group	Range of Service Years	n	Mean	Standard Deviation	Standard Error
1	Less than 9 years	14	14.64	2.50	0.67
2	Between 9 and 17 years, inclusive	8	13.75	2.38	0.84
3	19 and above	10	13.59	2.95	0.93
All	Any length of service	34	14.17	2.60	0.45

Summative IPI Scores by Demographic Categories

The minimum possible summative score for the IPI is 45; the maximum possible summative score for the IPI is 225. Values for the mean, standard deviation, and standard error are reported for groups within each of the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member.

Gender

The demographic category of gender includes two groups. Summative overall IPI scores for these groups are reported in Table 53.

Table 53
IPI Summative Scores for Groups by Gender

Group	Gender	n	Mean	Standard Deviation	Standard Error
1	Females	25	158.85	14.04	2.81
2	Males	8	141.61	9.68	3.42
All	Females & Males	33	154.67	14.99	2.61

Age

The demographic category of age includes six groups. Summative overall IPI scores for these groups are reported in Table 54. Scores for group 5 (ages 65-70) and group 6 (ages 71 and over) will not be reported due to group size.

Table 54
IPI Summative Scores for Groups by Age Range

Group	Age Range	n	Mean	Standard Deviation	Standard Error
1	Under 35	2	128.00	9.90	7.00
2	35-44	8	150.50	10.86	3.84
3	45-54	7	147.13	17.70	6.69
4	55-64	16	160.32	13.70	3.43
All	All age ranges	34	153.68	15.85	2.72

Highest Degree Attained

The demographic category of highest degree attained includes responses for two groups. Summative overall IPI scores for these groups are reported in Table 55.

Table 55
IPI Summative Scores for Groups by Highest Degree Attained

Group	Degree	n	Mean	Standard Deviation	Standard Error
1	Doctorate or Professional	3	166.85	7.00	4.04
2	Master's	31	152.40	15.94	2.86
All	Either	34	153.68	15.85	2.72

Academic Rank

The demographic category of academic rank includes five groups. Summative overall IPI scores for these groups are reported in Table 56.

Table 56
IPI Summative Scores for Groups by Academic Rank

Group	Academic Rank	n	Mean	Standard Deviation	Standard Error
1	Full Professor	15	154.13	12.72	3.29
2	Associate Professor	3	143.67	7.68	4.84
3	Assistant Professor	5	157.78	27.09	12.11
4	Instructor or Lecturer	5	148.19	21.74	9.72
5	Other or not applicable	6	158.68	8.85	3.61
All	All academic ranks	34	153.68	15.85	2.72

Total Years of Teaching Experience

The demographic category of total years of teaching experience includes three groups. Summative overall IPI scores for these groups are reported in Table 57.

Table 57
IPI Summative Scores for Groups by Total Years of Teaching Experience

Group	Range of Experience	n	Mean	Standard Deviation	Standard Error
1	0-15	10	152.10	18.16	5.74
2	17-25	14	152.95	15.09	4.03
3	27 and over	10	156.26	15.86	5.01
All	All ranges	34	153.68	15.85	2.72

Total Years of Service as a Full-Time Community College Faculty Member

The demographic category of total years of service as a full-time community college faculty member includes three groups. Summative overall IPI scores for these groups are reported in Table 58.

Table 58
IPI Summative Scores for Groups by Total Years of Service as a Full-Time Community College Faculty Member

Group	Range of Service Years	n	Mean	Standard Deviation	Standard Error
1	Less than 9 years	14	158.07	19.77	5.28
2	Between 9 and 17 years, inclusive	8	147.26	8.28	2.93
3	19 and above	10	154.66	14.51	4.59
All	Any length of service	34	153.68	15.85	2.72

Differences within Demographic Categories

An Analysis of Variance (ANOVA) was conducted within the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member for summative subscale scores, for summative overall IPI scores, and by question response. A Tukey Post Hoc Test was performed for demographic variables with more than two groups. Statistically significant findings are reported by demographic category.

Gender

Part (a) of Research Question One is: "What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by gender?" A statistically significant difference was found between groups for subscale one (Teacher empathy with

learners), subscale two (Teacher trust of learners), subscale four (Accommodating learner uniqueness), and the summative overall IPI score. ANOVA results are reported in Tables 59 through 62, respectively.

Table 59
ANOVA for Subscale One – Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	43.53	1	43.53	8.79	0.006
Within groups	153.44	31	4.95		
Total	196.97	32			

Table 60
ANOVA for Subscale Two – Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	236.27	1	236.27	12.87	0.001
Within groups	568.93	31	18.35		
Total	805.20	32			

Table 61
ANOVA for Subscale Four – Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	49.89	1	49.89	6.13	0.019
Within groups	252.10	31	8.13		
Total	301.99	32			

Table 62
ANOVA for Summative IPI – Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	1801.70	1	1801.70	10.37	0.003
Within groups	5386.92	31	173.77		
Total	7188.62	32			

Statistically significant differences were found on subscale one (teacher empathy with learners) for the additional demographic variable of highest degree attained. Group 1 for

the demographic variable highest degree attained is a wholly contained subset of Group 1 for the demographic variable of gender; therefore, the results of an ANOVA to test for interaction effect were inconclusive. Statistically significant differences were found on subscales two (teacher trust of learners), four (accommodating learner uniqueness), and the summative IPI score for the additional demographic variable of age. The results of Analyses of Variance conducted showed no statistically significant interaction effect.

Statistically significant differences were found on particular questions of the Instructional Perspectives Inventory (IPI). ANOVA tables for these questions may be found in Appendix F. Differences are reported by subscale in the following sections.

Subscale one: Teacher empathy with learners (gender).

Statistically significant differences were found on question 12 (How frequently do you notice and acknowledge to learners positive changes in them?) [$F(1,31) = 6.43$, $p < 0.016$]; question 19 (How frequently do you balance your efforts between learner content acquisition and motivation?) [$F(1,31) = 5.71$, $p < 0.023$]; and question 33 (How frequently do you promote positive self-esteem in learners?) [$F(1,31) = 8.55$, $p < 0.006$] within this subscale.

Subscale two: Teacher trust of learners (gender).

Statistically significant differences were found on question 7 (How frequently do you purposefully communicate to learners that each is uniquely important?) [$F(1,31) = 11.45$, $p < 0.002$]; question 8 (How frequently do you express confidence that learners will develop the skills they need?) [$F(1,31) = 8.13$, $p < 0.008$]; question 30 (How frequently do you enable learners to evaluate their own progress in learning?) [$F(1,31) = 6.75$,

$p < 0.014$] and question 45 (How frequently do you respect the dignity and integrity of the learners?) [$F(1,31) = 9.92$, $p < 0.004$] within this subscale. Statistically significant differences were found on questions 7 and 45 for the demographic variable of age. A statistically significant interaction effect was found on question 7 [$F(2,31) = 4.07$, $p < 0.031$] for the demographic variables of gender and age. No statistically significant interaction effect was found on question 45.

Subscale three: Planning and delivery of instruction (gender).

Statistically significant differences were found on question 22 (How frequently do you establish instructional objectives?) [$F(1,31) = 4.60$, $p < 0.40$] within this subscale. Statistically significant differences were found on question 22 for the demographic variables of gender, total years of teaching experience, and total years of service as a full-time community college faculty member. Tests for interaction effect with gender were inconclusive.

Subscale four: Accommodating learner uniqueness (gender).

Statistically significant differences were found on question 14 (How frequently do you believe that learners vary in the way they acquire, process, and apply subject matter knowledge?) [$F(1,31) = 15.71$, $p < 0.000$] within this subscale. Statistically significant differences were found for the demographic variables of age and academic rank for question 14. Tests for interaction effects with gender were inconclusive.

Subscale six: Experience-based learning techniques (gender).

Statistically significant differences were found on question 21 (How frequently do you conduct group discussions?) [$F(1,31) = 8.01$, $p < 0.008$] within this subscale.

Racial or Ethnic Group

Part (b) of Research Question One is: "What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by self-identified ethnicity?" Due to the lack of a representative sample, the responses from this group will not be reported. This question cannot be answered with the results of this study.

Age

Part (c) of Research Question One is: "What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by age?" Statistically significant differences were found between groups for subscale two (Teacher trust of learners), subscale four (Accommodating learner uniqueness), and summative IPI scores. ANOVA results are reported in Tables 63 through 65, respectively. Post Hoc tests to determine which group differences were statistically significant were not possible due to group size.

Table 63
ANOVA for Subscale Two – Age

	Sum of Squares	df	Mean Square	F	Significance
Between groups	291.75	4	72.94	3.98	0.011
Within groups	532.12	29	18.35		
Total	823.87	33			

Table 64
ANOVA for Subscale Four – Age

	Sum of Squares	df	Mean Square	F	Significance
Between groups	109.91	4	27.48	3.34	0.023
Within groups	238.80	29	8.24		
Total	348.71	33			

Table 65
ANOVA for Summative IPI – Age

	Sum of Squares	df	Mean Square	F	Significance
Between groups	2671.38	4	667.85	3.45	0.020
Within groups	5621.29	29	193.84		
Total	8292.67	33			

Statistically significant differences were found on subscales two (teacher trust of learners), four (accommodating learner uniqueness), and the summative IPI score for the additional demographic variable of gender. The results of Analyses of Variance conducted revealed no statistically significant interaction effect.

Statistically significant differences were found on particular questions of the Instructional Perspectives Inventory (IPI). ANOVA tables for these questions may be found in Appendix F. Differences are reported by subscale in the following sections.

Subscale two: Teacher trust of learners (age).

Statistically significant differences were found on question 7 (How frequently do you purposefully communicate to learners that each is uniquely important?) [$F(4,29) = 2.88$, $p < 0.040$] and question 45 (How frequently do you respect the dignity and integrity of the learners?) [$F(4,29) = 2.86$, $p < 0.041$]. Statistically significant differences were found on questions 7 and 45 for the demographic variable of gender. A statistically significant interaction effect was found on question 7 [$F(2,31) = 4.07$, $p < 0.031$] for the

demographic variables of gender and age. No statistically significant interaction effect was found on question 45.

Subscale three: Planning and delivery of instruction (age).

Statistically significant differences were found on question 9 (How frequently do you search for or create new teaching?) [$F(4,29) = 9.23$, $p < 0.000$] within this category.

Subscale four: Accommodating learner uniqueness (age).

Statistically significant differences were found on question 14 (How frequently do you believe that learners vary in the way they acquire, process, and apply subject matter knowledge?) [$F(4,29) = 6.13$, $p < 0.001$] within this category. Statistically significant differences were found on question 14 for the demographic variables of gender and academic rank. The test for interaction effect with gender revealed no statistically significant interaction effect. The test for interaction effect with academic rank revealed a statistically significant interaction effect [$F(4,31)=4.32$, $p < 0.020$].

Subscale five: Teacher insensitivity toward learners (age).

Statistically significant differences were found on 18 (How frequently do you feel impatient with learner's progress?) [$F(4,29) = 3.79$, $p < 0.014$] within this category. Statistically significant differences were found on question 18 for the demographic variable of highest degree attained. An ANOVA revealed no statistically significant interaction effect. between these variables for this question.

Highest degree attained

Part (d) of Research Question One is: "What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by level of education?

Statistically significant differences were found between groups for subscale one (teacher empathy with learners) and subscale five (teacher insensitivity toward learners). ANOVA results are reported in Tables 66 and 67, respectively.

Table 66
ANOVA for Subscale One – Highest Degree Attained

	Sum of Squares	df	Mean Square	F	Significance
Between groups	24.97	1	24.97	4.26	0.047
Within groups	187.76	32	5.87		
Total	212.74	33			

Table 67
ANOVA for Subscale Five – Highest Degree Attained

	Sum of Squares	df	Mean Square	F	Significance
Between groups	99.18	1	99.18	9.99	0.003
Within groups	317.76	32	9.93		
Total	416.94	33			

Statistically significant differences were found on subscale five (teacher insensitivity toward learners) for the additional demographic variable of total number of years of service as a full-time faculty member at a community college. An ANOVA revealed a statistically significant interaction effect [$F(1,32)=4.39$, $p < 0.046$] between the demographic variables of highest degree attained and total number of years of service as a full-time faculty member at a community college for subscale five.

Statistically significant differences were found on particular questions of the Instructional Perspectives Inventory (IPI). ANOVA tables for these questions may be found in Appendix F. Differences are reported by subscale in the following sections.

Subscale one: Teacher empathy with learners (highest degree attained).

Statistically significant differences were found on question 26 (How frequently do you

express appreciation to learners who actively participate?) [$F(1,32) = 6.38$, $p < 0.017$] within this category.

Subscale two: Teacher trust of learners (highest degree attained).

Statistically significant differences were found on questions 16 (How frequently do you trust learners to know what their own goals, dreams, and realities are like?) [$F(1,32) = 4.62$, $p < 0.039$] and question 29 (How frequently do you feel learners need to be aware of and communicate their thoughts and feelings?) [$F(1,32) = 4.98$, $p < 0.033$] within this category.

Subscale four: Accommodating learner uniqueness (highest degree attained).

Statistically significant differences were found on question 6 (How frequently do you expect and accept learner frustration as they grapple with problems?) [$F(1,32) = 4.95$, $p < 0.033$] within this category.

Subscale five: Teacher insensitivity toward learners (highest degree attained).

Statistically significant differences were found on question 13 (How frequently do you have difficulty getting your point across to learners?) [$F(1,32) = 5.79$, $p < 0.022$]; question 18 (How frequently do you feel impatient with learner's progress?) [$F(1,32) = 4.16$, $p < 0.050$]; and question 32 (How frequently do you have difficulty with the amount of time learners need to grasp various concepts?) [$F(1,32) = 7.62$, $p < 0.009$] within this category. Statistically significant differences were found on question 13 for the demographic variable of academic rank. An ANOVA revealed a statistically significant interaction effect [$F(1,32)=4.90$, $p < 0.036$] between the variables of highest degree attained and academic rank for this question. Statistically significant differences were found on question 18 for the demographic variable of age. An ANOVA revealed no

statistically significant interaction effect between the variables of highest degree attained and age for question 18.

Academic Rank

Part (e) of Research Question One is: "What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by academic rank?" No statistically significant differences were found for subscale scores or for summative IPI scores for the groups within this category. Statistically significant differences were found on particular questions of the Instructional Perspectives Inventory (IPI). ANOVA tables for these questions may be found in Appendix F. Differences are reported by subscale in the following sections.

Subscale four: Accommodating learner uniqueness (academic rank).

Statistically significant differences were found on question 14 (How frequently do you believe that learners vary in the way they acquire, process, and apply subject matter knowledge?) [$F(4,29) = 2.97$, $p < 0.036$]. A Tukey Post Hoc Test did not show a statistically significant difference between particular groups. Statistically significant differences were found on question 14 for the demographic variables of gender and age. An ANOVA revealed a statistically significant interaction effect [$F(4,31)=4.31$, $p < 0.020$] for the demographic variables of academic rank and age. A test for interaction effect of gender by age by academic rank was inconclusive.

Subscale five: Teacher insensitivity toward learners (academic rank).

Statistically significant differences were found on question 13 (How frequently do you have difficulty getting your point across to learners?) [$F(4,29) = 3.88$, $p < 0.012$). A

Tukey Post Hoc Test revealed a statistically significant difference of 0.047 between Full Professors (Group 1) and Associate Professors (Group 2) and a statistically significant difference of 0.008 between Associate Professors (Group 2) and Assistant Professors (Group 3). Statistically significant differences were found on question 13 for the demographic variable of highest degree attained. An ANOVA revealed a statistically significant interaction effect [$F(1,32)=4.90$, $p < 0.036$] between the demographic variables of academic rank and highest degree attained for question 13.

Total Years of Teaching Experience

Part (f) of Research Question One is: "What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by teaching experience?" No statistically significant differences were found for subscale scores or for summative IPI scores for the groups within this category. Statistically significant differences were found on particular questions of the Instructional Perspectives Inventory (IPI). ANOVA tables for these questions may be found in Appendix F. Differences are reported by subscale in the following sections.

Subscale three: Planning and delivery of instruction (total teaching experience).

Statistically significant differences were found on question 22 (How frequently do you establish instructional objectives?) [$F(2,31) = 4.39$, $p < 0.021$] within this category. Statistically significant differences were found on question 22 for the demographic variables of gender and total number of years of service as a full-time faculty member at a community college. Tests for interaction effect were inconclusive due to the nature of the groups.

Total Years of Service as a Full-Time Faculty Member at a Community College

Part (g) of Research Question One is: "What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by duration of service as a full-time faculty member at a community college? Statistically significant differences were found between groups for subscale five (Teacher insensitivity toward learners). ANOVA results are reported in Table 68. A Tukey Post Hoc Test revealed a statistically significant difference of 0.017 between participants with less than 9 years experience (Group 1) and participants with between 9 and 17 years experience (Group 2) and a statistically significant difference of 0.044 between participants with between 9 and 17 years service as a full-time faculty member at a community college (Group 2) and participants with more than 19 years service as a full-time faculty member at a community college (Group 3).

Table 68
ANOVA for Subscale Five - Total Years of Service as a Full-Time Community College Faculty Member

	Sum of Squares	df	Mean Square	F	Significance
Between groups	98.64	2	49.32	4.77	0.016
Within groups	299.83	29	10.34		
Total	398.47	31			

Statistically significant differences were found on subscale five (teacher insensitivity toward learners) for the additional demographic variable of highest degree attained. An ANOVA revealed a statistically significant interaction effect [$F(1,32)=4.39$, $p < 0.046$] between the demographic variables of highest degree attained and total number of years of service as a full-time faculty member at a community college for subscale five.

Statistically significant differences were found on particular questions of the Instructional Perspectives Inventory (IPI). ANOVA tables for these questions may be found in Appendix F. Differences are reported by subscale in the following sections.

Subscale two: Teacher trust of learners (years of service).

Statistically significant differences were found on question 44 (How frequently do you experience unconditional positive regard for your learners?) [$F(2,29) = 4.04$, $p < 0.028$] within this category. A Tukey Post Hoc Test revealed a statistically significant difference of 0.016 between participants with less than nine years of service as a full-time faculty member at a community college (Group 1) and participants with between nine and seventeen years of service as a full-time faculty member at a community college (Group 2).

Subscale three: Planning and delivery of instruction (years of service).

Statistically significant differences were found on question 22 (How frequently do you establish instructional objectives?) [$F(2,29) = 8.30$, $p < 0.001$] within this subscale. A Tukey Post Hoc Test revealed statistically significant differences of 0.008 between participants with less than 9 years of service as a full-time faculty member at a community college (Group 1) and participants with between 9 and 17 years of service as a full-time faculty member at a community college (Group 2) and 0.004 between participants with less than 9 years of service as a full-time faculty member at a community college (Group 1) and participants with more than 19 years of service as a full-time faculty member at a community college (Group 3). Statistically significant differences were found on question 22 for the demographic variables of gender and total years of teaching experience. Tests for interaction effect were inconclusive.

Subscale five: Teacher insensitivity toward learners (years of service).

Statistically significant differences were found on question 18 (How frequently do you feel impatient with learner's progress?) [$F(2,29) = 4.16$, $p < 0.026$] within this subscale. A Tukey Post Hoc Test revealed a statistically significant difference of 0.031 between participants with less than 9 years of service as a full-time faculty member at a community college (Group 1) and participants with between 9 and 17 years of service as a full-time faculty member at a community college (Group 2).

Adult Education Courses Completed by Participants

Part (h) of Research Question One is: "What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by whether or not members have completed graduate courses in adult education?" Due to a lack of responses for this category, this question cannot be answered with the results of this study.

Research Question Two

The second research question for this study is, "Is the IPI a reliable measure for this population?" In order to address this question, Cronbach's alpha reliability coefficient and the Spearman-Brown prophecy coefficient were calculated for the subscales of the Instructional Perspectives Inventory (IPI). The results of these calculations are reported in Table 69.

Table 69
Cronbach's Alpha and Spearman-Brown Coefficients for Subscales of the IPI

Subscale of the IPI	Cronbach's alpha	Spearman-Brown
1	0.68	0.81
2	0.78	0.88
3	0.53	0.70
4	0.55	0.71
5	0.69	0.82
6	0.71	0.83
7	0.47	0.64

Research Question Three

The third research question for this study is, "Does the IPI measure the dimensions it purports to measure?" A factor analysis should be performed to address this question. The sample size for this study was insufficient for a factor analysis. Therefore, this question cannot be addressed with the results of this study.

Chapter Summary

This chapter provides a report of the findings for this study. The study was conducted with the Instructional Perspectives Inventory (IPI) as the primary instrument. Approximately 23.4% of invited participants responded, yielding a sample size of 34. Demographic characteristics of the population are reported. The report of statistics conducted to address the research questions for this study does not include the demographic categories of "race or ethnic origin" due to lack of a representative sample or "adult education courses taken" due to the low response rate for that question.

Two primary research questions are addressed by this study. The first research question is: "What are the instructional perspectives of mathematics faculty at the

community college?" The mean, standard deviation, and standard error of summative subscale scores and summative overall IPI scores are reported in Tables 10 through 58. The results of Analyses of Variance (ANOVA's) on summative subscales of the IPI and summative overall IPI scores are reported in Tables 59-68. F values and statistical significance levels are reported for questions of the IPI. ANOVA results for questions of the IPI and statistically significant interaction effects are reported in Appendix F. Statistically significant differences were found on subscales one (teacher empathy with learners), two (teacher trust of learners), four (accommodating learner uniqueness), five (teacher insensitivity toward learners), and summative overall IPI scores. In addition, statistically significant differences were found for particular questions within subscales one through six of the IPI.

The second research question for this study is: "Is the IPI a reliable measure for this population?" Cronbach's alpha reliability coefficient and the Spearman-Brown prophecy coefficient for all subscales are reported in Table 69.

To address the third research question for this study: "Does the IPI measure the dimensions it purports to measure?", a factor analysis should be conducted. The population for this study is insufficient for a factor analysis.

Chapter five provides a summary and discussion of the findings from this study.

Chapter 5: Summary and Discussion of Findings

This chapter provides a summary and discussion of the findings from this study. The purpose, significance, and methodology for this study are reviewed. The findings reported in Chapter four are summarized. The research questions for this study are addressed, findings are discussed, and recommendations are made for future research directions.

Purpose and Significance of the Study

This study investigated the beliefs, feelings, and behaviors of mathematics faculty at the community college, as measured by the Instructional Perspectives Inventory (IPI). A review of both the literature of adult education and the literature of mathematics education finds few studies that specifically address the beliefs, feelings, and behaviors of mathematics faculty at the community college from a perspective informed by the research literature of adult education. By its nature – the use of an instrument that measures beliefs, feelings, and behaviors of adult educators with a population of mathematics faculty from the community college – this study is expected to contribute to the bridging of the research gap that exists between mathematics education and adult education.

Methodology

The instrument for this study was the Instructional Perspectives Inventory (IPI). Data were collected electronically through the use of the online survey program *Flashlight*™. The questionnaire for this study (Appendix C) consisted of the 45 items of the IPI with a five-point Likert scale for responses and questions to elicit information about the demographic characteristics of the population. Demographic categories were: gender,

age, race or ethnic origin, highest degree attained, academic rank, total years of teaching experience, total years of service as a full-time community college faculty member, and "adult education courses taken".

Approximately 23.4% of invited participants responded to the survey. This yielded a sample size of 34. Data from the survey were analyzed using the statistical software *SPSS* 14.0. Statistical analyses included calculations of mean, standard deviation, and standard error for summative subscale scores and summative overall IPI scores. Statistical significance for this study is set at $p < 0.05$. Analyses of Variance (ANOVA's) were conducted for summative subscale scores, summative overall IPI scores, and for the questions of the IPI. For demographic categories with more than two groups, a Tukey Post Hoc Test was conducted in conjunction with the ANOVA for that group. For summative subscale scores and items of the IPI where a statistically significant difference was found on more than one demographic variable, an additional ANOVA was conducted to detect interaction effects. Cronbach's alpha reliability coefficient and the Spearman-Brown prophecy coefficient were calculated for all subscales of the IPI.

Summary of Findings

The mean, standard deviation, and standard error for summative subscale scores and summative overall IPI scores were reported in Chapter four for the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member. The report of statistics conducted does not include the demographic categories of "race or ethnic origin" due to lack of a representative sample or "adult education courses taken" due to the low response rate for that question. The means of summative overall subscale

scores and summative overall IPI scores are discussed in this chapter.

Statistically significant differences were found on subscales one (teacher empathy with learners), two (teacher trust of learners), four (accommodating learner uniqueness), five (teacher insensitivity toward learners), and summative overall IPI scores. Statistically significant interaction effects were found on subscale five (teacher insensitivity toward learners). In addition, statistically significant differences were found on questions within subscales one through six of the IPI. Statistically significant interaction effects were found for three questions of the IPI. These differences will be discussed within this chapter.

Cronbach's alpha reliability coefficient and the Spearman-Brown prophecy coefficient were calculated for all subscales of the IPI. The results will be interpreted in terms of a rating scale (Table 4) proposed by George and Mallery (as cited in Gliem & Gliem, 2003, p. 87).

Research Question One

The first research question for this study is: "What are the instructional perspectives of community college mathematics faculty?" To address this question, the mean, standard deviation, and standard error were computed for summative overall IPI scores and summative subscale scores within the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member. These results were reported in Chapter four (Tables 10-58). For simplicity of comparison, the reported means of summative scores are summarized in Tables 70-77 on the following pages. The results are briefly interpreted within the following sections which are organized by summative

overall IPI scores and then by subscales of the IPI. A more elaborate interpretation of these results is provided in the discussion section of this chapter.

Summative IPI Scores

Stanton (2005) proposed category levels for the use of andragogical principles based on summative IPI scores (Table 1). Table 70 presents a summary of reported means of summative IPI scores by groups within demographic categories, applying Stanton's category levels.

Table 70
Use of Andragogical Principles Based on Means of Summative IPI Scores

Demographic category and group	n	Summative IPI Score	Andragogical Principles Rating
Gender* – Females	25	158.85	Average
Gender* – Males	8	141.61	Below average
Age* – less than 35	2	128.00	Below average
Age* – 35-44	8	150.50	Average
Age* - 45-54	7	147.13	Below average
Age* - 55-64	16	160.32	Average
Degree – Doctorate/Professional	3	166.85	Average
Degree – Master's	31	152.40	Average
Ac. rank – Full Professor	15	154.13	Average
Ac. rank – Associate Professor	3	144.67	Below average
Ac. rank – Assistant Professor	5	157.78	Average
Ac. rank – Instructor/Lecturer	5	148.19	Below average
Ac. rank – Other	6	158.68	Average
Total teaching experience – 0-15	10	152.10	Average
Total teaching experience – 17-25	14	152.95	Average
Total teaching experience – 27 or more	10	156.26	Average
Years ft faculty member at cc – less than 9	14	158.07	Average
Years ft faculty member at cc – 9-17	8	147.26	Below average
Years ft faculty member at cc – 19 or more	10	154.66	Average
All participants for this study	34	153.68	Average

*Statistically significant differences between groups for this demographic category.

From the table, it may be observed that none of the groups who participated in this study scored in either the "high above average" or the "above average" category. Multiple groups who participated in this study scored "below average" for the application of andragogical principles. No groups within the demographic categories of "highest degree attained" and "total years of teaching experience" scored "below average". This

may be interpreted to mean that the community college mathematics faculty members who participated in this study are generally average in their application of andragogical principles.

Subscale One: Teacher Empathy with Learners

A summary of reported means of summative scores for subscale one of the IPI is provided in Table 71.

Table 71
Means of Subscale One (Teacher Empathy with Learners) Summative Scores by Groups within Demographic Categories

Demographic category and group	n	Summative Subscale Score
Gender* – Females	25	20.68
Gender* – Males	8	18.00
Age – less than 35	2	16.50
Age – 35-44	8	20.25
Age – 45-54	7	19.57
Age – 55-64	16	20.13
Degree* – Doctorate/Professional	3	22.67
Degree* – Master's	31	19.65
Ac. rank – Full Professor	15	20.13
Ac. rank – Associate Professor	3	18.67
Ac. rank – Assistant Professor	5	20.20
Ac. rank – Instructor/Lecturer	5	19.40
Ac. rank – Other	6	20.17
Total teaching experience – 0-15	10	20.10
Total teaching experience – 17-25	14	20.14
Total teaching experience – 27 or more	10	19.40
Years ft faculty member at cc – less than 9	14	20.64
Years ft faculty member at cc – 9-17	8	20.00
Years ft faculty member at cc – 19 or more	10	19.30
All participants for this study	34	19.91

*Statistically significant differences between groups for this demographic category.

The minimum summative score for this subscale is 5. The maximum summative score for this subscale is 25. Items for this subscale are positively phrased. A higher score for this subscale would indicate increased emphasis on the application of adult education principles. In Table 71, it may be observed that the lowest score is attributed to the "less than 35" age group and the highest score to the "doctorate/professional" degree group.

This may be interpreted to mean that those participants in this study who are younger than 35 have less empathy for learners than others in this study and that those participants in this study with doctorate or other professional degrees have more empathy for learners.

Subscale Two: Teacher Trust of Learners

A summary of reported means of summative scores for subscale two of the IPI is provided in Table 72.

Table 72
Means of Subscale Two (Teacher Trust of Learners) Summative Scores by Groups within Demographic Categories

Demographic category and group	n	Summative Subscale Score
Gender* – Females	25	41.96
Gender* – Males	8	35.72
Age* – less than 35	2	30.50
Age* – 35-44	8	39.25
Age* - 45-54	7	39.14
Age - 55-64	16	42.36
Degree – Doctorate/Professional	3	45.18
Degree – Master's	31	39.85
Ac. rank – Full Professor	15	40.99
Ac. rank – Associate Professor	3	37.33
Ac. rank – Assistant Professor	5	40.98
Ac. rank – Instructor/Lecturer	5	39.01
Ac. rank – Other	6	40.67
Total teaching experience – 0-15	10	40.10
Total teaching experience – 17-25	14	39.88
Total teaching experience – 27 or more	10	41.14
Years ft faculty member at cc – less than 9	14	41.92
Years ft faculty member at cc – 9-17	8	38.38
Years ft faculty member at cc – 19 or more	10	40.64
All participants for this study	34	40.32

*Statistically significant differences between groups for this demographic category.

The minimum summative score for this subscale is 11. The maximum summative score for this subscale is 55. Items for this subscale are positively phrased. A higher score for this subscale would indicate increased emphasis on the application of adult education principles. In Table 72 it may be observed that the lowest score may be attributed to the "less than 35" age group and the highest score to the "doctorate/professional" degree group. This may be interpreted to mean that those participants in this study who are younger than 35 have less trust of learners than others in this study and that those participants in this study with doctorate or other professional degrees trust learners more.

Subscale Three: Planning and Delivery of Instruction

A summary of reported means of summative scores for subscale three of the IPI is provided in Table 73.

Table 73
Means of Subscale Three (Planning and Delivery of Instruction) Summative Scores by Groups within Demographic Categories

Demographic category and group	n	Summative Subscale Score
Gender – Females	25	19.40
Gender – Males	8	17.25
Age – less than 35	2	15.50
Age – 35-44	8	18.50
Age – 45-54	7	18.15
Age - 55-64	16	19.56
Degree – Doctorate/Professional	3	19.67
Degree – Master's	31	18.74
Ac. rank – Full Professor	15	17.99
Ac. rank – Associate Professor	3	19.00
Ac. rank – Assistant Professor	5	18.80
Ac. rank – Instructor/Lecturer	5	19.21
Ac. rank – Other	6	20.50
Total teaching experience – 0-15	10	17.90
Total teaching experience – 17-25	14	18.64
Total teaching experience – 27 or more	10	20.00
Years ft faculty member at cc – less than 9	14	18.43
Years ft faculty member at cc – 9-17	8	19.00
Years ft faculty member at cc – 19 or more	10	19.80
All participants for this study	34	18.82

The minimum summative score for this subscale is 5. The maximum summative score for this subscale is 25. Items for this subscale are positively phrased. A higher score for this subscale would indicate increased emphasis on the application of adult education principles. In Table 73, it may be observed that the lowest score is attributed to the "less than 35" age group and the highest score to the academic rank group of "other". This

may be interpreted to mean that those participants in this study who are younger than 35 are least likely to apply andragogical principles to their planning and delivery of instruction than others in this study and that those participants in this study who responded to the category of "other" when describing academic rank are most likely to apply andragogical principles to their planning and delivery of instruction.

Subscale Four: Accommodating Learner Uniqueness

A summary of reported means of summative scores for subscale four of the IPI is provided in Table 74.

Table 74
Means of Subscale Four (Accommodating Learner Uniqueness) Summative Scores by Groups within Demographic Categories

Demographic category and group	n	Summative Subscale Score
Gender* – Females	25	25.63
Gender* – Males	8	22.77
Age* – less than 35	2	20.00
Age* – 35-44	8	24.25
Age* - 45-54	7	23.57
Age* - 55-64	16	25.69
Degree – Doctorate/Professional	3	24.67
Degree – Master's	31	24.74
Ac. rank – Full Professor	15	24.73
Ac. rank – Associate Professor	3	23.00
Ac. rank – Assistant Professor	5	24.60
Ac. rank – Instructor/Lecturer	5	23.60
Ac. rank – Other	6	26.69
Total teaching experience – 0-15	10	24.00
Total teaching experience – 17-25	14	25.00
Total teaching experience – 27 or more	10	25.10
Years ft faculty member at cc – less than 9	14	25.43
Years ft faculty member at cc – 9-17	8	24.13
Years ft faculty member at cc – 19 or more	10	24.60
All participants for this study	34	24.73

*Statistically significant differences between groups for this demographic category.

The minimum summative score for this subscale is 7. The maximum summative score for this subscale is 35. Items for this subscale are positively phrased. A higher score for this subscale would indicate increased emphasis on the application of adult education principles. In Table 74, it may be observed that the lowest score is attributed to the "less than 35" age group and the highest score to the academic rank group of "other". This

may be interpreted to mean that those participants in this study who are younger than 35 are least likely to accommodate learner uniqueness than others in this study and that those participants in this study who responded to the category of "other" when describing academic rank are more likely to accommodate learner uniqueness.

Subscale Five: Teacher Insensitivity Toward Learners

A summary of mean summative scores for subscale five of the IPI is provided in Table 75.

Table 75
Means of Subscale Five (Teacher Insensitivity Toward Learners) Summative Scores by Groups within Demographic Categories

Demographic category and group	n	Summative Subscale Score
Gender – Females	25	25.36
Gender – Males	8	25.25
Age – less than 35	2	27.50
Age – 35-44	8	24.38
Age – 45-54	7	22.29
Age - 55-64	16	26.38
Degree* – Doctorate/Professional	3	30.67
Degree* – Master's	31	24.65
Ac. rank – Full Professor	15	26.33
Ac. rank – Associate Professor	3	21.67
Ac. rank – Assistant Professor	5	26.40
Ac. rank – Instructor/Lecturer	5	23.20
Ac. rank – Other	6	24.67
Total teaching experience – 0-15	10	26.60
Total teaching experience – 17-25	14	23.86
Total teaching experience – 27 or more	10	25.60
Years ft faculty member at cc* – less than 9	14	26.43
Years ft faculty member at cc* – 9-17	8	22.25
Years ft faculty member at cc* – 19 or more	10	26.10
All participants for this study	34	25.18

*Statistically significant differences between groups for this demographic category.

The minimum summative score for this subscale is 7. The maximum summative score for this subscale is 35. Items for this subscale are negatively phrased. A higher score for this subscale would indicate decreased emphasis on the application of adult education principles. In Table 75, it may be observed that the lowest score is attributed to the group of participants who identified themselves as having the academic rank of "associate

professor" and the highest score to the "doctorate/professional" degree group. This may be interpreted to mean that those participants for this study with doctorate or professional degrees are less insensitive toward learners than others in this study and that those participants in this study who hold the rank of "associate professor" are more insensitive toward learners.

Subscale Six: Experience-Based Learning Techniques

A summary of reported means of summative scores for subscale six of the IPI is provided in Table 76.

Table 76
Means of Subscale Six (Experience-Based Learning Techniques) Summative Scores by Groups within Demographic Categories

Demographic category and group	n	Summative Subscale Score
Gender – Females	25	11.26
Gender – Males	8	9.00
Age – less than 35	2	6.00
Age – 35-44	8	10.13
Age – 45-54	7	10.43
Age - 55-64	16	11.40
Degree – Doctorate/Professional	3	11.33
Degree – Master's	31	10.47
Ac. rank – Full Professor	15	9.70
Ac. rank – Associate Professor	3	10.33
Ac. rank – Assistant Professor	5	12.20
Ac. rank – Instructor/Lecturer	5	10.20
Ac. rank – Other	6	11.67
Total teaching experience – 0-15	10	10.10
Total teaching experience – 17-25	14	10.50
Total teaching experience – 27 or more	10	11.05
Years ft faculty member at cc – less than 9	14	10.57
Years ft faculty member at cc – 9-17	8	10.75
Years ft faculty member at cc – 19 or more	10	10.65
All participants for this study	34	10.54

The minimum summative score for this subscale is 5. The maximum summative score for this subscale is 25. Items for this subscale are positively phrased. A higher score for this subscale would indicate increased emphasis on the application of adult education principles. In Table 76, it may be observed that the lowest score may be attributed to the "less than 35" age group and the highest score to the group of participants who identified

themselves as having the academic rank of "assistant professor". This may be interpreted to mean that participants in this study who are younger than 35 use less experience-based learning techniques than others in this study and that the group of participants who identified themselves as having the academic rank of "assistant professor" use more experience-based learning techniques.

Subscale Seven: Teacher-Centered Learning Process

A summary of mean summative scores for subscale seven of the IPI is provided in Table 77.

Table 77
Means of Subscale Seven (Teacher-Centered Learning Process) Summative Scores by Groups within Demographic Categories

Demographic category and group	n	Summative Subscale Score
Gender – Females	25	14.56
Gender – Males	8	13.63
Age – less than 35	2	12.00
Age – 35-44	8	13.75
Age – 45-54	7	13.97
Age - 55-64	16	14.81
Degree – Doctorate/Professional	3	12.67
Degree – Master's	31	14.32
Ac. rank – Full Professor	15	14.27
Ac. rank – Associate Professor	3	13.67
Ac. rank – Assistant Professor	5	14.60
Ac. rank – Instructor/Lecturer	5	13.56
Ac. rank – Other	6	14.33
Total teaching experience – 0-15	10	13.30
Total teaching experience – 17-25	14	14.93
Total teaching experience – 27 or more	10	13.98
Years ft faculty member at cc – less than 9	14	14.64
Years ft faculty member at cc – 9-17	8	13.75
Years ft faculty member at cc – 19 or more	10	13.59
All participants for this study	34	14.17

The minimum summative score for this subscale is 5. The maximum summative score for this subscale is 25. Items for this subscale are negatively phrased. A higher score for this subscale would indicate decreased emphasis on the application of adult education principles. In Table 77, it may be observed that the lowest score is attributed to the "less than 35" age group and the highest score to the group of participants with between 17 and

25 total years of teaching experience. This may be interpreted to mean that participants in this study with between 17 and 25 total years of teaching experience use less of a teacher-centered learning process than others in this study and that those participants in this study who are younger than 35 use more of a teacher-centered learning process.

Statistically Significant Differences – Summative IPI Scores

The first research question for this study, "What are the instructional perspectives of community college mathematics faculty?" includes the following parts:

(a) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by gender?

(b) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by self-identified ethnicity?

(c) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by age?

(d) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by level of education?

(e) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by academic rank?

(f) What are the differences in instructional perspectives of mathematics faculty at the

community college when the set of mathematics faculty at the community college is classified by teaching experience?

(g) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by duration of service as a full-time faculty member at a community college?

(h) What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by whether or not members have completed graduate courses in adult education?

Part (b) of this question will not be addressed due to lack of a representative sample and part (h) of this question will not be addressed due to a lack of response for this item on the questionnaire for this study.

The results of an Analysis of Variance (ANOVA) revealed statistically significant differences within some categories for summative subscale scores, summative overall IPI scores and for responses to some questions. Table 78 shows statistically significant results for all subscales and all demographic categories analyzed.

Table 78
Statistically Significant Differences for Summative Scores by Demographic Category

Demographic	Subscale 1	Subscale 2	Subscale 3	Subscale 4	Subscale 5	Subscale 6	Subscale 7	IPI
Gender	0.006*	0.001		0.019				0.003
Age		0.011		0.023				0.023
Degree	0.047*				0.003**			
Academic rank								
Total teaching experience								
Total ft at cc					0.016**			

*Test for interaction effect inconclusive due to the nature of the groups within this category.
**Statistically significant interaction effects found.

In Table 78, it may be observed that statistically significant differences were found for groups within the demographic category of gender on subscales one (teacher empathy with learners), two (teacher trust of learners), four (accommodating learner uniqueness), and the IPI; statistically significant differences were found for groups within the demographic category of age on subscales one (teacher empathy with learners), two (teacher trust of learners), four (accommodating learner uniqueness), and the IPI; statistically significant differences were found for groups within the demographic category of highest degree attained on subscales one (teacher empathy with learners) and five (teacher insensitivity toward learners); statistically significant differences were found for groups within the demographic category of total years of service as a full-time community college faculty member for subscale five (teacher insensitivity toward learners).

These results should be interpreted with caution. Although no statistically significant interaction was found for the demographic categories of gender and highest degree attained, it should be noted that Group 1 of the category highest degree attained is a complete subset for Group 1 of gender. Although no statistically significant interaction was found for the demographic categories of gender and age, it should be noted that Group 4, the largest group for the demographic category of age, is 88% female. A statistically significant interaction effect was found for the demographic categories of highest degree attained and total years of service as a full-time community college faculty member.

Research Question Two

The second research question for this study is, “Is the IPI a reliable measure for this

population?" Cronbach's alpha reliability coefficient and the Spearman-Brown prophecy coefficient were calculated for each of the subscales of the IPI. Table 79 provides an interpretation of these values based on the ratings scale proposed by George and Mallery (as cited in Gliem & Gliem, 2003, p. 87) and initially presented in Table 4.

Table 79
Interpretation of the Reliability of the IPI for this Population

Subscale of the IPI	Cronbach's alpha	Spearman-Brown	Reliability Rating
1	0.68	0.81	Good
2	0.78	0.88	Good
3	0.53	0.70	Acceptable
4	0.55	0.71	Acceptable
5	0.69	0.82	Good
6	0.71	0.83	Good
7	0.47	0.64	Questionable

Reliability is a measure of the internal consistency of an instrument - whether or not test items measure a purported attribute. A factor analysis can aid in the interpretation of Cronbach's alpha. In the absence of a factor analysis, results for subscale seven should be interpreted with caution.

Discussion of Findings

The discussion of findings begins with an interpretation of summative scores for the Instructional Perspectives Inventory (IPI) in terms of the application of andragogical principles. Analyses of Variance (ANOVA's) conducted for this study revealed statistically significant differences on subscales one (teacher empathy with learners), two (teacher trust of learners), four (accommodating learner uniqueness), five (teacher insensitivity toward learners) and summative IPI scores and for some questions of the IPI.

To facilitate a discussion of these findings, the questions of the IPI are presented by subscale in Tables 80 through 86. The results of analyses on subscale scores and questions within the respective subscales are discussed, followed by a comparison of findings from this study with other studies conducted using the IPI.

Summative IPI Scores

Stanton (2005) recommended that future studies with the Instructional Perspectives Inventory (IPI) include an analysis of summative IPI scores. Category levels for the use of andragogical principles were suggested (Table 1). Applying these category levels to the summative IPI scores for this study, participants were found to be "average" or "below average" (Table 70) in their use of andragogical principles. Andragogical principles for practice are based on the assumption that the learner is self-directed and that learning objectives are negotiable. The underprepared nature of community college students and the content-driven nature of the study of mathematics provide challenges to the andragogical orientation of mathematics faculty members at the community college.

Knowles' (1968) andragogical model for the adult learning experience includes the engagement of the adult in the diagnosis of his or her own learning needs and the involvement of participants in planning what they will learn and how they will learn it. Pratt (1993) has suggested that the negotiation of learning objectives and evaluation of learning may not be appropriate for particular content areas. Multiple authors note how the underprepared nature of community college students provides challenges to the classroom practices of faculty members (Almeida, 1991; Brookfield, 2002; Bryant, 2001; Byrd & MacDonald, 2005; Fugate & Amey, 2000; Grubb, 1999; Hoyt, 1999; Kozeracki, 2002; Miller et al., 2005; Perin, 2006; Weisman & Longacre, 2000).

Elements of the instructional process include the learner, the content, and the teacher. The categorization of community college mathematics faculty as "average" or "below average" in the use of andragogical principles is consistent with the literature stating that the choice of instructional techniques is influenced by consideration of the elements of the instructional process: the teacher, the learner, the group, the content, and the environment (Conti, 1985b; Conti & Kolody, 1998; Conti & Wellburn, 1986; Galbraith, 1998; Grubb, 1999; Handal, 2003; Miglietti & Strange, 1998; Ross-Gordon, 2002). In addition, this finding supports a description of the application of andragogical principles as situational (Brookfield, 1986; Carlson, 1980; Davenport, 1987; Holmes, 1980; Knowles, 1980; McKenzie, 1985; Merriam, 2001; Pratt, 1988; Rachel, 2002).

A comparison of summative IPI scores across demographic categories finds that for the categories of highest degree attained and total years of teaching experience all groups within these categories scored in the "average" range. A comparison of the subscale scores for groups within demographic categories finds the following: the lowest ranking score for any group on subscales one through four, six, and seven is within the demographic category of age; for subscale four, both the highest and lowest scores overall were in the age category; those participants who identified themselves as having doctorate or professional degrees consistently scored higher than those with a master's degree; scores for participants with more teaching experience were consistently higher than those participants with less teaching experience; scores for participants with less service as a full-time community college faculty member were consistently higher than other groups within that category.

Conti and Wellborn (1986) describe teaching style as "the operational behavior of a

teacher's educational philosophy" (p. 20). Multiple authors describe influences on teaching style (Conti, 1985b; Conti & Kolody, 1998; Conti & Wellburn, 1986; Galbraith, 1998; Grubb, 1999; Handal, 2003; Miglietti & Strange, 1998; Ross-Gordon, 2002). A comparison of the summative IPI scores for this study reveal the influence of age, academic experience, and experiential background.

Subscale One: Teacher Empathy with Learners

The questions for subscale one are presented in Table 80.

Table 80 Questions for Subscale One: Teacher Empathy with Learners

Question Number	How frequently do you: [*Almost Never, Not Often, Sometimes, Usually, Almost*]
4	Feel fully prepared to teach?
12	Notice and acknowledge to learners positive changes in them?
19	Balance your efforts between learner content acquisition and motivation?
26	Express appreciation to learners who actively participate?
33	Promote positive self-esteem in learners?

No statistically significant differences were found for question four. This may be interpreted to mean that participants for this study share a common definition of being prepared to teach. This is consistent with findings by Kozeracki (2002) that community college faculty have the clearest sense of purpose of any sector of higher education and that clarity of commitment to teaching is an important element of job satisfaction for community college faculty. Statistically significant differences were found for the demographic category of gender on questions 12, 19, and 22. These results should be interpreted with caution as the population for this study is not a representative sample of the population of postsecondary faculty. The lack of statistically significant differences on questions 12, 19, and 22 for the category of number of years of service as a full-time faculty member may be interpreted as being consistent with Grubb's (1999) description of community college faculty members' "basic sympathy" (p. 38) for students.

Subscale Two: Teacher Trust of Learners

The questions for subscale two are presented in Table 81.

Table 81
Questions for Subscale Two: Teacher Trust of Learners

Question Number	How frequently do you: [*Almost Never, Not Often, Sometimes, Usually, Almost*]
7	Purposefully communicate to learners that each is uniquely important?
8	Express confidence that learners will develop the skills they need?
16	Trust learners to know what their own goals, dreams, and realities are like?
28	Prize the learner's ability to learn what is needed?
29	Feel learners need to be aware of and communicate their thoughts and feelings?
30	Enable learners to evaluate their own progress in learning?
31	Hear what learners indicate their learning needs are?
39	Engage learners in clarifying their own aspirations?
43	Develop supportive relationships with your learners?
44	Experience unconditional positive regard for your learners?
45	Respect the dignity and integrity of the learners?

No statistically significant differences were found on questions 28, 30, or 43 for this subscale. Students develop their understanding and interpretation of the language, symbols, representations, tools and inscriptions associated with the practice of mathematics as participants within the mathematical community (Greeno & Hall, 1997). Cobb (1988) suggests that as students learn to practice mathematics, they should develop increasing degrees of intellectual autonomy. Prizing, engaging, and supporting learners contribute to a classroom climate conducive to this development. It may be interpreted from this finding that the participants in this study share a common discourse in terms of students' participation in mathematical practices and their development of intellectual autonomy.

Statistically significant differences for the demographic category of number of years as a full-time faculty member at a community college on questions 31 and 44 contrast

with Grubb's (1999) description of community college faculty members' "basic sympathy" (p. 38) for students. There is an implication of disagreement in terms of teacher empathy for learners among the participants for this study. Statistically significant differences for the demographic categories of gender, age, and highest degree attained on questions 7, 8, 16, 29, 30, and 45 are consistent with Conti's (1985b) description of some of the influences on teaching style.

Subscale Three: Planning and Delivery of Instruction

The questions for subscale three are presented in Table 82.

Table 82
Questions for Subscale Three: Planning and Delivery of Instruction

Question Number	How frequently do you: [*Almost Never, Not Often, Sometimes, Usually, Almost*]
1	Use a variety of teaching techniques?
9	Search for or create new teaching?
22	Establish instructional objectives?
23	Use a variety of instructional media (internet, distance, interactive video, videos, etc.)?
42	Integrate teaching techniques with subject matter content?

There were no statistically significant differences on summative scores for this subscale, or on questions 1, 23, and 42. These three questions directly relate to classroom practices. Cobb and Yackel (1996) note that the practice of mathematics may be perceived as being regulated by sociomathematical norms. These findings are consistent with the notion of sociomathematical norms for instruction and the teacher's role as a mediator of mathematical meanings (Cobb, 1994; Lerman, 2001).

Subscale Four: Accommodating Learner Uniqueness

The questions for subscale four are presented in Table 83.

Table 83
Questions for Subscale Four: Accommodating Learner Uniqueness

Question Number	How frequently do you: [*Almost Never, Not Often, Sometimes, Usually, Almost*]
6	Expect and accept learner frustration as they grapple with problems?
14	Believe that learners vary in the way they acquire, process, and apply subject matter knowledge?
15	Really listen to what learners have to say?
17	Encourage learners to solicit assistance from other learners?
37	Individualize the pace of learning for each learner?
38	Help learners explore their own abilities?
40	Ask the learners how they would approach a learning task?

There were no statistically significant differences on questions 17, 37, 38, or 40. As with the findings for subscale two, it may be interpreted from this finding that the participants in this study share a common discourse in terms of students' development of intellectual autonomy.

Subscale Five: Teacher Insensitivity Toward Learners

The questions for subscale five are presented in Table 84.

Table 84
Questions for Subscale Five: Teacher Insensitivity Toward Learners

Question Number	How frequently do you: [*Almost Never, Not Often, Sometimes, Usually, Almost*]
5	Have difficulty understanding learner point-of-views?
13	Have difficulty getting your point across to learners?
18	Feel impatient with learner's progress?
27	Experience frustration with learner apathy?
32	Have difficulty with the amount of time learners need to grasp various concepts?
36	Get bored with the many questions learners ask?
41	Feel irritation at learner inattentiveness in the learning setting?

No statistically significant differences were found for questions 5, 27, 36, and 41. Cobb (1994) and Lerman (2001) describe the role of the mathematics teacher as a mediator of mathematical meaning. This finding may be interpreted to mean that the

participants in this study share a common perception of their roles as mediators of mathematical meaning. Statistically significant differences were found for the demographic categories of age, degree, and academic rank for particular questions on this subscale. These findings are consistent with Conti's (1985b) description of influences on teaching style.

Subscale Six: Experience-Based Learning Techniques

The questions for subscale six are presented in Table 85.

Table 85
Questions for Subscale Six: Experience-Based Learning Techniques

Question Number	How frequently do you: [*Almost Never, Not Often, Sometimes, Usually, Almost*]
2	Use buzz groups (learners placed in groups to discuss information from lectures?
10	Teach through simulations of real-life?
21	Conduct group discussions?
24	Use listening teams (learners grouped together to listen for a specific purpose) during lectures?
35	Conduct role plays?

No statistically significant difference was found for scores on this subscale. This may be interpreted to mean that participants for this study share a common discourse of teaching. There were no statistically significant differences found for questions 2, 10, 24, and 35. The teaching behaviors described in questions 2, 21, 24, and 35 are not common to the teaching of mathematics.

Subscale Seven: Teacher-Centered Learning Process

The questions for subscale seven are presented in Table 86.

Table 86
Questions for Subscale Seven: Teacher-Centered Learning Process

Question Number	How frequently do you: [*Almost Never, Not Often, Sometimes, Usually, Almost*]
3	Believe that your primary goal is to provide learners as much information as possible?
11	Teach exactly what and how you have planned?
20	Try to make your presentations clear enough to forestall all learner questions?
25	Believe that your teaching skills are as refined as they can be?
34	Require learners to follow the precise learning experiences you provide them?

There were no statistically significant differences found for this subscale or for the questions of this subscale. Grasha (1994) describes some of the influences on teaching style: "the nature of the course; the subject matter; the need to prepare students for standard exams; and not wanting to deviate from department and college norms for teaching" (p. 3). These are common influences on the practice of teaching mathematics at the community college. It may be interpreted from these findings that participants in this study share a common discourse regarding teaching behaviors.

Other Studies with the IPI

A comparison of the results of Analyses of Variance (ANOVA's) conducted for this study with findings from other studies using the IPI shows both similar and dissimilar findings. For subscale one (teacher empathy with learners), statistically significant differences were found for highest degree attained, this is consistent with the findings by Dawson (1997) and Stricker (2006). For subscale two (teacher trust of learners), statistically significant differences were found for age, this is consistent with findings by Seward (1997). Both Dawson (1997) and Drinkard (2003) found statistically significant differences on scores for subscale two for the category of highest degree attained, a

finding not supported in this study. No statistically significant differences were found in this study for scores on subscale three (planning and delivery of instruction); this is inconsistent with Seward's (1997) finding of statistically significant differences among subscale three scores for age groups.

In this study, statistically significant differences were found for scores on subscale four (accommodating learner uniqueness) for both gender and age, no other studies with the IPI show either gender groups or age groups as having statistically significant differences on scores for subscale four. For subscale five (teacher insensitivity toward learners), statistically significant differences were found for groups within the category highest degree attained, this is consistent with Stricker's (2006) findings. In contrast, Stricker (2006) also found gender as an influence on scores for subscale five. No statistically significant differences were found on scores for either subscale six (experience-based learning techniques) or subscale seven (teacher-centered learning process) in this study; these contrast with Dawson's (1997) findings of the influence of highest degree attained for scores on both these subscales.

Findings of statistically significant differences in studies by Thomas (1995), Dawson (1997), Seward (1997), Drinkard (2003), Stanton (2005), Stricker (2006), and the current researcher are both similar and dissimilar. Both similarities and dissimilarities should be interpreted with caution due to the contrasting nature of the populations for these studies – parent educators, nurse educators, parent educators, nurse educators, adult educators, elementary and secondary school teachers and principals, and community college mathematics faculty, respectively.

As noted in Chapter three, there are significant threats to the generalizability of this

study. Approximately 23.4% of invited participants responded to the questionnaire for this study – both sampling bias and nonresponse bias must be considered when interpreting the results of this study. The demographic characteristics of the participants for this study are not reflective of the population of postsecondary faculty as described in the findings of the National Survey of Postsecondary Faculty (NCES, 2007). In addition both the diversity of the respective missions and populations served by community colleges in Missouri (Farnsworth, 1997) and the variability of the nature of community colleges (Grubb, 1999) must be considered.

Directions for Future Research

Gender was the most likely demographic factor to yield a statistically significant finding in Analyses of Variance for subscale and summative IPI scores. Although this finding should be interpreted with caution due to the nature of the groups for this study, it should be considered in the design of future studies that include the Instructional Perspectives Inventory (IPI).

This study and previous studies with the IPI (Dawson, 1997; Drinkard, 2003) have included a question about how participants may have been exposed to the principles of practice for adult education. This information may aid in the interpretation of responses to the IPI. It is recommended that future studies with the IPI include such a question.

An interpretation of Cronbach's alpha reliability coefficient and the Spearman-Brown prophecy coefficient for this study finds "good" or "acceptable" internal consistency on six of the seven subscales of the IPI. Subscale seven is interpreted as having "questionable" internal consistency. An interpretation of Stanton's (2005) calculated Cronbach's alpha for subscale seven finds "acceptable" internal consistency and an

interpretation of Thomas's (1995) Cronbach's alpha finds "poor" internal consistency. Thus, studies by Thomas (1995), Stanton (2005), and the current researcher have found dissimilar interpretations of the internal consistency of the IPI for their respective populations. It is recommended that a calculation of Cronbach's alpha reliability coefficient and the Spearman-Brown prophecy coefficient be included in future studies with the IPI.

A factor analysis can aid in the interpretation of Cronbach's alpha. It is recommended that future studies with the IPI be conducted with populations sufficient for the conduct of a factor analysis.

A limitation of the use of questionnaires or surveys is the possibility of misinterpretation of questions and the constraint of participants not being able to explicate their responses (Furlong et al., 2000; Gay & Airasian, 2000). It is recommended that future studies with the IPI include a qualitative component such as interviews or observations.

Any discussion of teaching practices should include the effectiveness of those practices. It is recommended that a future research design with the IPI include a component that measures the effectiveness of the teaching practices of the population of participants.

Chapter Summary

The purpose and significance of this study were introduced in Chapter one. Chapter two provided a review of the literature of adult education pertaining to the discourse of teachers of adults, a sociocultural perspective on adult education, and the community college. In addition, a review of the literature of mathematics education providing a

sociocultural perspective was discussed. Chapter three introduced the methodology for this study. A report of findings from statistical analyses was provided in Chapter four.

Three research questions were considered by this study. The first research question: "What are the instructional perspectives of community college mathematics faculty?" and the second research question: "Is the IPI a reliable measure for this population?" were addressed. The third research question for this study: "Does the IPI measure the dimensions it purports to measure?" cannot be addressed due to sample size

To address the first research question for this study, "What are the instructional perspectives of community college mathematics faculty?", the mean, standard deviation, and standard error were calculated for summative IPI scores. The findings were interpreted to mean that the population for this study is "average" or "below average" in the application of andragogical principles. This finding is supported by the research literature of adult education that argues that the application of andragogical principles is situational – andragogical and pedagogical approaches to learning are appropriate at different times and for different purposes (Brookfield, 1986; Carlson, 1980; Davenport, 1987; Holmes, 1980; Knowles, 1980; McKenzie, 1985; Merriam, 2001; Pratt, 1988; Rachel, 2002).

Parts a through h of the first research question for this study inquire, "What are the differences in instructional perspectives of mathematics faculty at the community college when the set of mathematics faculty at the community college is classified by (gender, self-identified ethnicity, age, level of education – highest degree attained, academic rank, teaching experience, duration of service as a full-time faculty member at a community college, whether or not members have completed graduate courses in adult education,

respectively)?" Part (b) of this question related to self-identified ethnicity was not addressed due to lack of a representative sample and part (h) of this question related to adult education courses taken was not addressed due to a lack of response for this item on the questionnaire for this study. Group scores within the demographic categories of gender, age, highest degree attained, academic rank, teaching experience, and duration of service as a full-time faculty member at a community college were compared and Analyses of Variance (ANOVA's) were conducted.

A comparison of the subscale scores for groups within demographic categories found that age, highest degree attained, and duration of service as a full-time faculty member at a community college seemed to influence subscale scores. These findings were interpreted to be consistent with Conti's (1985b) description of some of the influences on teaching style.

Analyses of Variance (ANOVA's) revealed statistically significant differences for subscales one (teacher empathy with learners), two (teacher trust of learners), four (accommodating learner uniqueness), five (teacher insensitivity toward learners), and for summative overall IPI scores. An interaction effect was found for groups within the demographic categories of highest degree attained and duration of service as a full-time faculty member at a community college. Statistically significant differences were found for groups within the category of gender on subscales one, two, four and summative IPI scores. These results should be interpreted with caution due to the nature of groups within the population of participants for this study.

The findings of statistically significant differences (or not) for the questions of subscale one – teacher empathy with learners – were interpreted to mean that participants

for this study share a common definition of being prepared to teach and that findings are consistent with Grubb's (1999) description of community college faculty members' "basic sympathy" (p. 38) for students. A note of caution is provided for statistically significant differences found for the demographic category of gender.

The findings of statistically significant differences (or not) for the questions of subscale two – teacher trust of learners – were interpreted to mean that the participants in this study share a common discourse in terms of students' participation in mathematical practices and their development of intellectual autonomy.

The findings of statistically significant differences (or not) for the questions of subscale three - planning and delivery of instruction – were interpreted as being consistent with the notion of sociomathematical norms and the teacher's role as a mediator of mathematical meanings.

The findings of statistically significant differences (or not) for the questions of subscale four - accommodating learner uniqueness – were interpreted to mean that the participants in this study share a common discourse in terms of students' development of intellectual autonomy.

The findings of statistically significant differences (or not) for the questions of subscale five - teacher insensitivity toward learners - were interpreted to mean that the participants in this study share a common perception of their roles as mediators of mathematical meaning and as being consistent with Conti's (1985b) description of influences on teaching style.

The findings of statistically significant differences (or not) for the questions of subscale six - experience-based learning techniques – were interpreted to mean that

participants for this study share a common discourse of teaching. It was noted that some questions describe teaching behaviors not common to the teaching of mathematics.

The finding of no statistically significant differences on the questions for subscale seven - teacher-centered learning process – were interpreted to mean that participants in this study share a common discourse regarding teaching behaviors.

A comparison of the results of this study with studies by Thomas (1995), Dawson (1997), Seward (1997), Drinkard (2003), Stanton (2005), and Stricker (2006) found both similar and dissimilar results. A caution is provided regarding interpretation of this finding due to the contrasting nature of the populations for these respective studies.

The second research question addressed by this study is, "Is the IPI a reliable measure for this population?" Cronbach's alpha reliability coefficient and the Spearman-Brown prophecy coefficient were calculated for the seven subscales of the IPI. Findings were interpreted using a reliability rating scale suggested by George and Mallery (as cited in Gliem & Gliem, 2003, p. 87). Six of the seven subscales were interpreted as having "good" or "acceptable" internal consistency. Subscale seven – teacher-centered learning process - was found to have "questionable" consistency for this population. A contrast of these findings with studies by Thomas (1995) and Stanton (2005) leads to a recommendation that future studies with the IPI include a calculation and interpretation of Cronbach's alpha reliability coefficient and the Spearman-Brown prophecy coefficient.

A consideration of the influence of gender is suggested for future studies with the Instructional Perspectives Inventory (IPI). In addition, future studies with the IPI should include a calculation and interpretation of Cronbach's alpha reliability coefficient and the Spearman-Brown prophecy coefficient and be designed with a sample population

sufficient for factor analysis. The calculation of Cronbach's alpha reliability coefficient and the Spearman-Brown prophecy coefficient paired with a factor analysis will greatly enhance the utility of the IPI by providing a measure of the internal consistency of the instrument. The inclusion of a qualitative research component such as interviews or observations in studies with the IPI and/or a research design that includes a measure of the effectiveness of teacher practices may provide further insights into the beliefs, feelings, and behaviors of adult educators.

This study may provide some insights into the discourse of community college mathematics faculty – their andragogical orientation and their teaching practices. As adult educators, they are expected to apply andragogical principles of practice as they facilitate learning. As mathematics educators, they are expected to guard the content of mathematics as they mediate mathematical meanings for their students. As community college faculty members, they are expected to provide effective learning experiences for a diverse set of learners. The Instructional Perspectives Inventory (IPI) provides an opportunity for community college mathematics faculty to reflect critically on their practice and the beliefs that inform their practice.

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APPENDIX A: LETTER OF PERMISSION FROM DR. HENSCHKE

College of Education

Division of Educational Leadership
and Policy Studies

One University Boulevard
St. Louis, Missouri 63121-4400
Telephone: 314-516-5944
Fax: 314-516-5942

2/2/07

Ms. Laurie McManus
112 Handlan Ct.
St. Louis, MO 63122

Dear Ms. McManus:

I am pleased that you wish to use my Instructional Perspectives Inventory (IPI), in your doctoral dissertation research study regarding "The Instructional Perspectives of Community College Mathematics Faculty." I hereby give you permission to use this copyrighted instrument. I would expect an appropriate citation for the tool in your dissertation or any publications that result from using the tool.

If there is any other way I may help you in this process, please let me know. My best wishes to you in your research.

Most Sincerely,

John A. Henschke, Ed. D.
Associate Professor – Adult Education

APPENDIX B: THE INSTRUCTIONAL PERSPECTIVES INVENTORY (IPI)

Modified Instructional Perspectives Inventory
(Henschke, 1989, Stanton, 2005)

Listed below are 45 statements reflecting beliefs, feelings, and behaviors beginning or seasoned teachers of adults may or may not possess at a given moment. Please indicate how frequently each statement typically applies to you as you work with adult learners. Circle the number that best describes you.

A = Almost Never; B = Not Often; C = Sometimes; D = Usually; E = Almost Always

How frequently do you:

1. Use a variety of teaching techniques?	A B C D E
2. Use buzz groups (learners placed in groups to discuss information from lectures)?	A B C D E
3. Believe that your primary goal is to provide learners as much information as possible?	A B C D E
4. Feel fully prepared to teach?	A B C D E
5. Have difficulty understanding learner point-of-views?	A B C D E
6. Expect and accept learner frustration as they grapple with problems?	A B C D E
7. Purposefully communicate to learners that each is uniquely important?	A B C D E
8. Express confidence that learners will develop the skills they need?	A B C D E
9. Search for or create new teaching?	A B C D E
10. Teach through simulations of real-life?	A B C D E
11. Teach exactly what and how you have planned?	A B C D E
12. Notice and acknowledge to learners positive changes in them?	A B C D E
13. Have difficulty getting your point across to learners?	A B C D E

A = Almost Never; B = Not Often; C = Sometimes; D = Usually; E = Almost Always

How frequently do you:

14. Believe that learners vary in the way they acquire, process, and apply subject matter knowledge?	A B C D E
15. Really listen to what learners have to say?	A B C D E
16. Trust learners to know what their own goals, dreams, and realities are like?	A B C D E
17. Encourage learners to solicit assistance from other learners?	A B C D E
18. Feel impatient with learner's progress?	A B C D E
19. Balance your efforts between learner content acquisition and motivation?	A B C D E
20. Try to make your presentations clear enough to forestall all learner questions?	A B C D E
21. Conduct group discussions?	A B C D E
22. Establish instructional objectives?	A B C D E
23. Use a variety of instructional media? (internet, distance, interactive video, videos, etc.)	A B C D E
24. Use listening teams (learners grouped together to listen for a specific purpose) during lectures?	A B C D E
25. Believe that your teaching skills are as refined as they can be?	A B C D E
26. Express appreciation to learners who actively participate?	A B C D E
27. Experience frustration with learner apathy?	A B C D E
28. Prize the learner's ability to learn what is needed?	A B C D E
29. Feel learners need to be aware of an communicate their thoughts and feelings?	A B C D E
30. Enable learners to evaluate their own progress in learning?	A B C D E
31. Hear what learners indicate their learning needs are?	A B C D E

A = Almost Never; B = Not Often; C = Sometimes; D = Usually; E = Almost Always

How frequently do you:

32. Have difficulty with the amount of time learners need to grasp various concepts?	A	B	C	D	E
33. Promote positive self-esteem in learners?	A	B	C	D	E
34. Require learners to follow the precise learning experiences you provide them?	A	B	C	D	E
35. Conduct role plays?	A	B	C	D	E
36. Get bored with the many questions learners ask?	A	B	C	D	E
37. Individualize the pace of learning for each learner?	A	B	C	D	E
38. Help learners explore their own abilities?	A	B	C	D	E
39. Engage learners in clarifying their own aspirations?	A	B	C	D	E
40. Ask the learners how they would approach a learning task?	A	B	C	D	E
41. Feel irritation at learner inattentiveness in the learning setting?	A	B	C	D	E
42. Integrate teaching techniques with subject matter content?	A	B	C	D	E
43. Develop supportive relationships with your learners?	A	B	C	D	E
44. Experience unconditional positive regard for your learners?	A	B	C	D	E
45. Respect the dignity and integrity of the learners?	A	B	C	D	E

Scoring the Instructional Perspectives Inventory:

A = 1 B = 2 C = 3 D = 4 E = 5

(1)	**(2)**	**(3)**	**(4)**	**(5)***	**(6)**	**(7)***
4.	7.	1.	6.	5.	2.	3.
12.	8.	9.	14.	13.	10.	11.
19.	16.	22.	15.	18.	21.	20.
26.	28.	23.	17.	27.	24.	25.
33.	29.	42.	37.	32.	35.	34.
	30.		38.	36.		
	31.		40.	41.		
	39.					
	43.					
	44.					
	45.					
TOTAL	**TOTAL**	**TOTAL**	**TOTAL**	**TOTAL**	**TOTAL**	**TOTAL**
MEAN	**MEAN**	**MEAN**	**MEAN**	**MEAN**	**MEAN**	**MEAN**

(Factors 5 and 7 are reverse-scored)

FACTORS	**MEAN**
1. Teacher empathy with learners.	_____
2. Teacher trust of learners.	_____
3. Planning and delivery of instruction.	_____
4. Accommodating learner uniqueness.	_____
5. Teacher insensitivity toward learners.	_____
6. Experience-based learning techniques (Learner-centered learning process)	_____
7. Teacher-centered learning process	_____

APPENDIX C: THE QUESTIONNAIRE FOR THIS STUDY

Instructional Perspectives of Community College Mathematics Faculty

INFORMED CONSENT – PLEASE READ CAREFULLY

You are invited to participate in a research study about the beliefs, feelings, and behaviors of mathematics faculty members at the member colleges of the Missouri Community College Association. This study is being conducted by Laurie McManus (lkmdzb@umsl.edu or lmcmanus@stlcc.edu, 314-984-7346), a doctoral student at the University of Missouri – St. Louis and Professor of Mathematics at St. Louis Community College at Meramec. This study is being conducted as dissertation research, in partial completion of the requirements for a Doctor of Philosophy degree at the University of Missouri – St. Louis. You have been asked to participate in this research because you are a member of the mathematics faculty at a community college. Your responses to this survey will help to provide a comprehensive description of the beliefs, feelings, and behaviors of community college mathematics teachers. We ask that you read this information and contact Laurie McManus if you have any questions you may need answered before proceeding. Your answers are anonymous and cannot be traced to you. Your participation in this research is voluntary. Your decision whether or not to participate will not affect your current or future relationships with the University or your community college. If you decide to participate, you are free to decline to answer any individual questions, or to withdraw at any time.

Frequently Asked Questions:

1. What procedures are involved?
   If you agree to participate in this research, you will be asked to choose a response that represents your position on 45 statements and to provide some demographic information. This survey normally takes about 25 minutes to complete. Again, your participation is completely voluntary, you may decline to answer any question(s), and you are free to withdraw at any time. A "blank" copy of this survey and/or a summary of the findings will be provided upon request.
2. What about privacy and confidentiality?
   The surveys are anonymous. Access to raw data is limited to the researcher.
3. What's the purpose of this research?
   The purpose of this research is to provide a descriptive analysis of the beliefs, feelings, and behaviors of mathematics faculty at the community college. Statistical analyses will be performed on survey responses. The results will be analyzed and findings will be reported as dissertation research. In addition, the findings may be presented at conferences and gatherings of mathematics faculty and other groups.
4. What are the potential risks and discomforts?
   There are no anticipated risks or discomforts associated with this research.
5. Are there benefits to taking part in the research?
   Other than the satisfaction of assisting a colleague, there are not direct benefits to you for taking part in this research.
6. What about privacy and confidentiality?
   This survey is presented using the electronic survey tool, Flashlight. Your answers are anonymous and cannot be traced to you. Data are reported in aggregate form only.
7. What are the costs for participating in this research?
   There are no costs associated with your participation in this research.
8. Will I be paid for my participation in this research? There will be no remuneration for your participation in this research.
9. Can I withdraw or be removed from the study?
   You can choose whether to participate in this research study or not. You may withdraw at any

time by exiting this survey. There will be no consequences of any kind for withdrawal. You may also refuse to answer any questions you do not want to answer.

10. Who should I contact if I have questions?
    The researcher conducting this study is Laurie McManus. You may contact the researcher at 314-984-7346, lkmdzb@umsl.edu, or lmcmanus@stlcc.edu. A "blank" copy of this survey and/or a summary of findings will be provided upon request.
11. What are my rights as a research subject?
    If you have any questions about your rights as a research subject, you may call the Chairperson of the Institutional Review Board at (314) 516-5897. (Reference Number: 070126M)
12. What if I am an UMSL student?
    You may choose not to participate, or to stop your participation in this research at any time. This decision will not affect your class standing or grades at UMSL. The investigator also may end your participation in this research. If this happens, your class standing will not be affected. You will not be offered or receive any special consideration if you participate in this research.
13. What if I am an UMSL employee?
    Your participation in this research is, in no way, part of your university duties, and your refusal to participate will not in any way affect your employment with the university or the benefits, privileges, or opportunities associated with your employment at UMSL. You will not be offered or receive any special consideration if you participate in this research.

Division of Educational Leadership and Policy Studies
University of Missouri
One University Boulevard
St. Louis, Missouri 63121-4499
E-mail: lkmdzb@umsl.edu or lmcmanus@stlcc.edu

CONTINUING WITH THIS SURVEY IMPLIES INFORMED AND FREE CONSENT TO BE A PARTICIPANT IN THE STUDY.

THE INSTRUCTIONAL PERSPECTIVES OF MATHEMATICS FACULTY MEMBERS AT THE COMMUNITY COLLEGE SURVEY OF BELIEFS, FEELINGS, AND BEHAVIORS

Listed below are 45 statements reflecting beliefs, feelings, and behaviors beginning or seasoned teachers of adults may or may not possess at a given moment.

How frequently do you:		Please indicate how frequently each statement typically applies to you as you work with adult learners.				
		Almost Never	Not Often	Sometimes	Usually	Almost Always
1.	Use a variety of teaching techniques?	○	○	○	○	○
2.	Use buzz groups (learners placed in groups to discuss information from lectures)?	○	○	○	○	○
3.	Believe that your primary goal is to provide learners as much information as possible?	○	○	○	○	○

4.	Feel fully prepared to teach?	○	○	○	○	○
5.	Have difficulty understanding learner point-of-views?	○	○	○	○	○
6.	Expect and accept learner frustration as they grapple with problems?	○	○	○	○	○
7.	Purposefully communicate to learners that each is uniquely important?	○	○	○	○	○
8.	Express confidence that learners will develop the skills they need?	○	○	○	○	○
9.	Search for or create new teaching?	○	○	○	○	○
10.	Teach through simulations of real-life?	○	○	○	○	○
11.	Teach exactly what and how you have planned?	○	○	○	○	○
12.	Notice and acknowledge to learners positive changes in them?	○	○	○	○	○
13.	Have difficulty getting your point across to learners?	○	○	○	○	○
14.	Believe that learners vary in the way they acquire, process, and apply subject matter knowledge?	○	○	○	○	○
15.	Really listen to what learners have to say?	○	○	○	○	○
16.	Trust learners to know what their own goals, dreams, and realities are like?	○	○	○	○	○
17.	Encourage learners to solicit assistance from other learners?	○	○	○	○	○
18.	Feel impatient with learner's progress?	○	○	○	○	○
19.	Balance your efforts between learner content acquisition and motivation?	○	○	○	○	○
20.	Try to make your presentations clear enough to forestall all learner questions?	○	○	○	○	○
21.	Conduct group discussions?	○	○	○	○	○
22.	Establish instructional objectives?	○	○	○	○	○
23.	Use a variety of instructional media? (internet, distance, interactive video, videos, etc.)	○	○	○	○	○
24.	Use listening teams (learners grouped together to listen for a specific purpose) during lectures?	○	○	○	○	○
25.	Believe that your teaching skills are as refined as they can be?	○	○	○	○	○
26.	Express appreciation to learners who actively participate?	○	○	○	○	○

27.	Experience frustration with learner apathy?	○	○	○	○	○
28.	Prize the learner's ability to learn what is needed?	○	○	○	○	○
29.	Feel learners' need to be aware of and communicate their thoughts and feelings?	○	○	○	○	○
30.	Enable learners to evaluate their own progress in learning?	○	○	○	○	○
31.	Hear what learners indicate their learning needs are?	○	○	○	○	○
32.	Have difficulty with the amount of time learners need to grasp various concepts?	○	○	○	○	○
33.	Promote positive self-esteem in learners?	○	○	○	○	○
34.	Require learners to follow the precise learning experiences you provide them?	○	○	○	○	○
35.	Conduct role plays?	○	○	○	○	○
36.	Get bored with the many questions learners ask?	○	○	○	○	○
37.	Individualize the pace of learning for each learner?	○	○	○	○	○
38.	Help learners explore their own abilities?	○	○	○	○	○
39.	Engage learners in clarifying their own aspirations?	○	○	○	○	○
40.	Ask the learners how they would approach a learning task?	○	○	○	○	○

41.	Feel irritation at learner inattentiveness in the learning setting?	○	○	○	○	○
42.	Integrate teaching techniques with subject matter content?	○	○	○	○	○
43.	Develop supportive relationships with your learners?	○	○	○	○	○
44.	Experience unconditional positive regard for your learners?	○	○	○	○	○
45.	Respect the dignity and integrity of the learners?	○	○	○	○	○

46. Are you presently serving as a full-time Mathematics faculty member at a community college in Missouri?

○ Yes

○ No

47. Gender
- ○ Female
- ○ Male

48. Age range
- ○ Under 35
- ○ 35 to 44
- ○ 45 to 54
- ○ 55 to 64
- ○ 65 to 70
- ○ 71 or older

49. Racial and ethnic group
- ○ White, non-Hispanic
- ○ Black, non-Hispanic
- ○ Asian
- ○ Hispanic
- ○ Other

50. Highest earned degree
- ○ Doctorate or professional
- ○ Master's
- ○ Bachelor's or less

51. Academic rank
- ○ Full professor
- ○ Associate professor
- ○ Assistant professor
- ○ Instructor or lecturer
- ○ Other or not applicable

52. Teaching experience-what grade levels have you taught? Please check all that apply.
- ☐ elementary school
- ☐ middle school/junior high
- ☐ high school
- ☐ graduate assistant
- ☐ trade or technical school
- ☐ community college

☐ four-year college or university

53. Please state your total years of teaching experience

54. Please state how many years you have served as a fulltime faculty member at the community college

55. Please describe any graduate courses that you may have taken in Adult Education.

APPENDIX D: E-MAILS SENT TO PARTICIPANTS

Title: Teaching Perspectives Survey - from a MOMATYC colleague

Dear colleague:

In addition to serving as a Professor of Mathematics at St. Louis Community College at Meramec, I am a doctoral student in the Adult Education Program at the University of Missouri – St. Louis. For my dissertation research, I will be proving a descriptive analysis of the beliefs, feelings, and behaviors of mathematics faculty at the community college, using questions from the Instructional Perspectives Inventory developed by Dr. John A. Henschke of the University of Missouri-St. Louis.

I am writing to invite you to participate in this study by completing a survey questionnaire. If you agree to participate in this survey, you will be asked to choose a response that represents your position on 45 statements and to provide some demographic information. The survey takes about 25 minutes to complete and will be available online for completion from February 21, 2007 to March 16, 2007. The survey will be closed to responses on March 17, 2007. Your responses to the survey will help to provide a comprehensive description of the beliefs, feelings, and behaviors of community college mathematics teachers.

The survey questionnaire for this study is provided electronically by a survey tool known as Flashlight™. Your answers are anonymous and cannot be traced to you. You may access the survey at the following URL by double-clicking on the link, filling out the survey, and then clicking to submit:

http://CTLSilhouette.wsu.edu/surveys/ZS56187

Thank you for your consideration. If you have further questions, please do not hesitate to contact me.

Laurie K. McManus
Professor of Mathematics
St. Louis Community College at Meramec

Title: Teaching Perspectives Survey – Thanks and a Worry

Dear colleague:

There may be some incompatibilities between our respective e-mail servers, internet browsers, and the electronic survey tool, Flashlight™. When the survey is submitted, a "Thank You Page" should appear on the screen of your computer monitor. Due to incompatibilities, some participants are receiving a message such as "Internet Explorer cannot display the webpage".

If you have already completed the survey, let's assume that your data was submitted successfully. If you have yet to complete the survey, I have been informed that if you copy the link for the survey into your browser and access the survey in that fashion, rather than through our respective e-mail servers, you will see the "Thank You Page" upon submission of the survey.

The URL for the survey is:

http://CTLSilhouette.wsu.edu/surveys/ZS56187

Thank you again for your consideration. If you have further questions, please do not hesitate to contact me.

Laurie K. McManus
Professor of Mathematics
St. Louis Community College at Meramec

Title: Teaching Perspectives Survey – Friendly Reminder

Dear colleague:

If you have not had the opportunity to complete the Teaching Perspectives Survey, the deadline has been extended to April 2, 2007. The survey takes about 25 minutes to complete and is available online for completion. Your responses to the survey will help to provide a comprehensive description of the beliefs, feelings, and behaviors of community college mathematics teachers.

There may be some incompatibilities between our respective e-mail servers, internet browsers, and the electronic survey tool, Flashlight™. When the survey is submitted, a "Thank You Page" should appear on the screen of your computer monitor. Due to incompatibilities, some participants are receiving a message such as "Internet Explorer cannot display the webpage".

If you have already completed the survey, thank you for your participation. If you have yet to complete the survey, I have been informed that if you copy the link for the survey into your browser and access the survey in that fashion, rather than through our respective e-mail servers, you will see the "Thank You Page" upon submission of the survey.

The URL for the survey is:

http://CTLSilhouette.wsu.edu/surveys/ZS56187

Thank you again for your consideration. If you have further questions, please do not hesitate to contact me.

Laurie K. McManus
Professor of Mathematics
St. Louis Community College at Meramec

APPENDIX E: IRB APPROVAL FOR THIS STUDY

University of Missouri St. Louis

OFFICE OF RESEARCH ADMINISTRATION

Interdepartmental Correspondence

Name: Laurie McManus

Title: Instructional Perspectives of Community College Mathematics Faculty

The chairperson of the Human Subjects Committee for UM-St. Louis has reviewed the above mentioned protocol for research involving human subjects and determined that the project qualifies for exemption from full committee review under Title 45 Code of Federal Regulations Part 46.101b. The time period for this approval expires one year from the date listed below. You must notify the Human Subjects Committee in advance of any proposed major changes in your approved protocol, e.g., addition of research sites or research instruments.

You must file an annual report with the committee. This report must indicate the starting date of the project and the number of subjects to date from start of project, or since last annual report, whichever is more recent.

Any consent or assent forms must be signed in duplicate and a copy provided to the subject. The principal investigator must retain the other copy of the signed consent form for at least three years following the completion of the research activity and they must be available for inspection if there is an official review of the UM-St. Louis human subjects research proceedings by the U.S. Department of Health and Human Services Office for Protection from Research Risks.

This action is officially recorded in the minutes of the committee.

Protocol Number	Date	Signature - Chair
070126M	2-15-07	C J Harris

APPENDIX F: ADDITIONAL ANOVA TABLES

Statistical significance for this study is $p < 0.05$. Statistically significant interaction effects were found on subscale five of the IPI for the demographic variables of highest degree attained and total years of service as a full-time community college faculty member. Results are reported in Table 87.

Table 87
ANOVA for Interaction Effect – Highest Degree Attained (degree) and Total Years of Service as a Full-Time Community College Faculty Member (totalcc)

	Type III Sum of Squares	df	Mean Square	F	Significance
degree	43.61	1	43.61	5.98	0.021
totalcc	64.02	2	32.01	4.39	0.022
degree*totalcc	32.04	1	32.04	4.39	0.046

Statistically significant differences were found on some questions of the Instructional Perspectives Inventory (IPI) for groups within the demographic categories of gender, age, highest degree attained, academic rank, total years of teaching experience, and total years of service as a full-time community college faculty member. The following tables report the results of Analyses of Variance (ANOVA's) that yielded statistically significant results. The tables are organized by demographic category and by subscale within each demographic category.

Gender

Within the demographic category of gender, statistically significant differences were found on questions within subscales one, two, three, four, and six. ANOVA results are reported by subscale in the following sections.

Subscale One: Teacher Empathy with Learners

Statistically significant differences were found on questions 12, 19, and 33. ANOVA

results are reported in Tables 88-90, respectively.

Table 88
ANOVA for Question 12 – Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	4.13	1	4.13	6.43	0.016
Within groups	19.88	31	0.64		
Total	24.00	32			

Table 89
ANOVA for Question 19 – Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	2.89	1	2.89	5.71	0.023
Within groups	15.66	31	0.51		
Total	18.55	32			

Table 90
ANOVA for Question 33 – Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	4.54	1	4.54	8.55	0.006
Within groups	16.44	31	0.53		
Total	20.97	32			

Subscale Two: Teacher Trust of Learners

Statistically significant differences were found on questions 7, 8, 30, and 45. ANOVA results are reported in Tables 91 and 93-95. A statistically significant interaction effect was found on Question 7 for the variables gender and age. ANOVA results for this effect are reported in Table 92.

Table 91
ANOVA for Question 7 – Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	6.86	1	6.86	11.45	0.002
Within groups	18.57	31	0.60		
Total	25.43	32			

Table 92
ANOVA for Interaction Effect – Gender and Age – Question 7

Type III	Sum of Squares	df	Mean Square	F	Significance
gen	1.44	1	1.44	2.923	0.10
age	2.63	4	0.66	1.340	0.285
gen*age	3.996	2	2.00	4.070	0.031

Table 93
ANOVA for Question 8 – Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	3.64	1	3.64	8.13	0.008
Within groups	13.88	31	0.45		
Total	17.52	32			

Table 94
ANOVA for Question 30 – Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	4.99	1	4.99	6.75	0.014
Within groups	22.89	31	0.74		
Total	27.88	32			

Table 95
ANOVA for Question 45 – Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	2.48	1	2.48	9.92	0.004
Within groups	7.76	31	0.25		
Total	10.24	32			

Subscale Three: Planning and Delivery of Instruction

Statistically significant differences were found on question 22. ANOVA results are reported in Table 96.

Table 96
ANOVA for Question 22 – Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	2.97	1	2.97	4.60	0.040
Within groups	20.00	31	0.65		
Total	22.97	32			

Subscale Four: Accommodating Learner Uniqueness

Statistically significant differences were found on question 14. ANOVA results are reported in Table 97.

Table 97
ANOVA for Question 14 – Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	6.75	1	6.75	15.71	0.000
Within groups	13.32	31	0.43		
Total	20.06	32			

Subscale Six: Experience-Based Learning Techniques

Statistically significant differences were found on question 21. ANOVA results are reported in Table 98.

Table 98
ANOVA for Question 21 Gender

	Sum of Squares	df	Mean Square	F	Significance
Between groups	8.23	1	8.23	8.01	0.008
Within groups	31.84	31	1.03		
Total	40.06	32			

Age

Within the demographic category of age, statistically significant differences were found on questions within subscale two, subscale three, subscale four, and five. ANOVA results are reported by subscale in the following sections.

Subscale Two: Teacher Trust of Learners

Statistically significant differences were found on questions 7 and 45 for this subscale. ANOVA results are reported in Tables 99 and 100, respectively.

Table 99
ANOVA for Question 7 – Age

	Sum of Squares	df	Mean Square	F	Significance
Between groups	8.09	4	2.02	2.88	0.040
Within groups	20.38	29	0.70		
Total	28.47	33			

Table 100
ANOVA for Question 45 – Age

	Sum of Squares	df	Mean Square	F	Significance
Between groups	2.97	4	0.74	2.86	0.041
Within groups	7.53	29	0.26		
Total	10.50	33			

Subscale Three: Planning and Delivery of Instruction

Statistically significant differences were found on question 9. ANOVA results are reported in Table 101.

Table 101
ANOVA for Question 9 – Age

	Sum of Squares	df	Mean Square	F	Significance
Between groups	17.65	4	4.1	9.23	0.000
Within groups	13.86	29	0.48		
Total	31.52	33			

Subscale Four: Accommodating Learner Uniqueness

Statistically significant differences were found on question 14. ANOVA results are reported in Table 102. A statistically significant interaction effect was found on Question 14 for the variables age and academic rank. ANOVA results for this effect are reported in Table 103.

Table 102
ANOVA for Question 14 – Age

	Sum of Squares	df	Mean Square	F	Significance
Between groups	10.09	4	2.52	6.13	0.001
Within groups	11.94	29	0.41		
Total	22.03	33			

Table 103
ANOVA for Interaction Effect – Age and Academic Rank – Question 14

Type III	Sum of Squares	df	Mean Square	F	Significance
age	2.01	3	0.67	3.85	0.036
acrank	4.20	4	1.05	6.02	0.006
age*acrank	3.01	4	0.75	4.31	0.020

Subscale Five: Teacher Insensitivity Toward Learners

Statistically significant differences were found on question 18. ANOVA results are reported in Table 104.

Table 104
ANOVA for Question 18 – Age

	Sum of Squares	df	Mean Square	F	Significance
Between groups	10.21	4	2.13	2.69	0.051
Within groups	19.55	29	0.79		
Total	29.77	33			

Highest Degree Attained

Within the demographic category of highest degree attained, statistically significant differences were found on questions within subscales one, two, four, and five. ANOVA results are reported by subscale in the following sections.

Subscale One: Teacher Empathy with Learners

Statistically significant differences were found on question 26. ANOVA results are reported in Table 105.

Table 105
ANOVA for Question 26 – Highest Degree Attained

	Sum of Squares	df	Mean Square	F	Significance
Between groups	3.49	1	3.49	6.38	0.017
Within groups	17.48	32	0.55		
Total	20.97	33			

Subscale Two: Teacher Trust of Learners

Statistically significant differences were found on questions 16 and 29. ANOVA results are reported in Tables 106 and 107, respectively.

Table 106
ANOVA for Question 16 – Highest Degree Attained

	Sum of Squares	df	Mean Square	F	Significance
Between groups	2.94	1	2.94	4.62	0.039
Within groups	20.41	32	0.64		
Total	23.36	33			

Table 107
ANOVA for Question 29 – Highest Degree Attained

	Sum of Squares	df	Mean Square	F	Significance
Between groups	3.09	1	3.09	4.98	0.033
Within groups	19.88	32	0.62		
Total	22.97	33			

Subscale Four: Accommodating Learner Uniqueness

Statistically significant differences were found on question 6. ANOVA results are reported in Table 108.

Table 108
ANOVA for Question 6 – Highest Degree Attained

	Sum of Squares	df	Mean Square	F	Significance
Between groups	2.18	1	2.18	4.95	0.033
Within groups	14.09	32	0.44		
Total	16.27	33			

Subscale Five: Teacher Insensitivity Toward Learners

Statistically significant differences were found on questions 13, 18, and 32. ANOVA results are reported in Tables 109, 111, and 112, respectively. A statistically significant interaction effect was found on Question 13 for the variables highest degree attained and academic rank. ANOVA results for this effect are reported in Table 110.

Table 109
ANOVA for Question 13 – Highest Degree Attained

	Sum of Squares	df	Mean Square	F	Significance
Between groups	2.85	1	2.85	5.79	0.022
Within groups	15.76	32	0.49		
Total	18.62	33			

Table 110
ANOVA for Interaction Effect – Highest Degree Attained and Academic Rank - Question 13

	Type III Sum of Squares	df	Mean Square	F	Significance
degree	0.25	1	0.25	0.81	0.378
acrank	6.41	4	1.60	5.11	0.004
degree*acrank	1.54	1	1.54	4.90	0.036

Table 111
ANOVA for Question 18 – Highest Degree Attained

	Sum of Squares	df	Mean Square	F	Significance
Between groups	3.42	1	3.42	4.16	0.050
Within groups	26.34	32	0.82		
Total	29.77	33			

Table 112
ANOVA for Question 32 – Highest Degree Attained

	Sum of Squares	df	Mean Square	F	Significance
Between groups	4.71	1	4.71	7.62	0.009
Within groups	19.76	32	0.62		
Total	24.47	33			

Academic Rank

Within the demographic category of academic rank, statistically significant differences were found on questions within subscales four and five. ANOVA results are reported by subscale in the following sections.

Subscale Four: Accommodating Learner Uniqueness

Statistically significant differences were found on question 14. A Tukey Post Hoc Test was conducted. This revealed no statistically significant difference between particular groups. ANOVA results are reported in Table 113.

Table 113
ANOVA for Question 14 – Academic Rank

	Sum of Squares	df	Mean Square	F	Significance
Between groups	6.40	4	1.60	2.97	0.036
Within groups	15.63	29	0.54		
Total	22.03	33			

Subscale Five: Teacher Insensitivity Toward Learners

Statistically significant differences were found on question 13. A Tukey Post Hoc

Test was conducted for this question. A statistically significant difference exists between groups 1 and 2 (0.047) and between groups 2 and 3 (0.008). ANOVA results are reported in Table 114.

Table 114
ANOVA for Question 13 – Academic Rank

	Sum of Squares	df	Mean Square	F	Significance
Between groups	6.48	4	1.62	3.88	0.012
Within groups	12.13	29	0.42		
Total	18.62	33			

Total Years of Teaching Experience

Within the demographic category of total years of teaching experience, statistically significant differences were found on questions within subscale three. ANOVA results are reported by subscale in the following sections.

Subscale Three: Planning and Delivery of Instruction

Statistically significant differences were found on question 22. A Tukey Post-Hoc Test revealed statistically significant differences between groups 1 and 3 (0.016). ANOVA results are reported in Table 115.

Table 115
ANOVA for Question 22 - Total Years of Teaching Experience

	Sum of Squares	df	Mean Square	F	Significance
Between groups	5.07	2	2.54	4.39	0.021
Within groups	17.90	31	0.58		
Total	22.97	33			

Total Years of Service as a Full-Time Faculty Member at a Community College

Within the demographic category of total years of service as a full-time faculty member at a community college, statistically significant differences were found on

questions within subscales two, three, and five. ANOVA results are reported by subscale in the following sections.

Subscale Two: Teacher Trust of Learners

Statistically significant differences were found on question 44 for this subscale. A Tukey Post Hoc Test revealed statistically significant differences between groups 1 and 2 (0.022). ANOVA results are reported in Table 116.

Table 116
ANOVA for Question 44 - Total Years as a Full-Time Faculty Member at a Community College

	Sum of Squares	df	Mean Square	F	Significance
Between groups	2.35	2	1.17	4.04	0.028
Within groups	8.43	29	0.29		
Total	10.77	31			

Subscale Three: Planning and Delivery of Instruction

Statistically significant differences were found on question 22. A Tukey Post Hoc Test revealed statistically significant differences between groups 1 and 2 (0.008) and between groups 1 and 3 (0.001). ANOVA results are reported in Table 117.

Table 117
ANOVA for Question 22 - Total Years as a Full-Time Faculty Member at a Community College

	Sum of Squares	df	Mean Square	F	Significance
Between groups	6.82	2	3.41	8.30	0.001
Within groups	11.90	29	0.41		
Total	18.71	31			

Subscale Five: Teacher Insensitivity Toward Learners

Statistically significant differences were found on question 18. A Tukey Post Hoc Test revealed statistically significant differences between groups 1 and 2 (0.031).

ANOVA results are reported in Table 118.

Table 118
ANOVA for Question18 - Total Years as a Full-Time Faculty Member at a Community College

	Sum of Squares	df	Mean Square	F	Significance
Between groups	6.52	2	3.26	4.16	0.026
Within groups	22.70	29	0.78		
Total	29.22	31			