

# Learning to Teach Culturally Diverse Learners: Charting Change in Preservice Teachers' Thinking about Effective Teaching

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## Abstract

We explored the use of 2 measurement strategies—concept maps and surveys—to assess the effects of a multicultural education course on the cognitions of individuals and groups of preservice teachers. Participants included 17 preservice teachers enrolled in a 5-week multicultural education course required as part of a 1-year M.Ed. and credential program at a public university. Data were gathered before and after the course to assess preservice teachers' beliefs and conceptual changes in their representations of effective teaching for culturally diverse learners. Results suggested that 2 groups of students began the course with distinct beliefs and conceptualizations in this area, as indicated by differences in the density of their concept maps. Results also suggested that multiple indicators of cognitive change must be used to better understand the effect of these courses on preservice teachers' cognitions. Group B students had lower-density maps prior to the course than after the course. Specifically, although the density of Group B students' conceptualizations of effective teaching increased after the course—a pattern that has been traditionally associated with more complex understanding—other indicators of conceptual change showed that these students did not actively reorganize their conceptualizations. Group A students exhibited the opposite pattern. Moreover, the qualitative data analysis indicated that each group of students emphasized a distinct view of teaching. These findings suggest that teacher educators and others working in this field can use concept maps and surveys to assess cognitive transformations in individuals and groups of teachers. This is best achieved through the analysis of both quantitative and qualitative indicators of cognitive changes.

## Research on Preservice Multicultural Teacher Education

The increasing diversity of the U.S. student population and their concomitant poor

*The Elementary School Journal*

Volume 98, Number 3

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0013-5984/98/9803-0001\$02.00

preservice teachers are aware of issues related to multiculturalism, they are undecided about their competence to teach culturally diverse students. The lack of clear patterns about the effects of these courses is distressing, particularly because such data could have great relevance for teacher education. Hence, it is imperative that researchers continue to examine the outcomes of multicultural education courses. Likewise, researchers also need to develop alternative means to assess the effects of these courses on preservice teachers. Thus, in this study we explored alternative measurement and data analysis strategies that teacher educators and others who work in the multicultural education field can use. Before we describe the study methods, we review briefly research on multicultural preservice teacher education.

### Outcomes of Multicultural Education Courses

Despite their increasing implementation, multicultural education courses and training have been criticized on several fronts. It has been argued, for instance, that efforts in this arena have been fraught with paradoxes and contradictions (McDiarmid, 1992). For example, preservice teachers are taught that they should see their pupils as unique individuals with singular backgrounds, knowledge, and experiences. At the same time, however, teacher educators in these training sessions frequently present broad generalizations about pupils of particular racial/ethnic and linguistic backgrounds. Likewise, although instructors spend considerable time addressing the benefits of individualized instruction and active learning for culturally diverse students, the formats used in these training sessions and courses are based primarily on traditional pedagogical models (i.e., lecturing, presentation of factual information) (McDiarmid, 1992; McDiarmid & Price, 1990). Hence, it is not surprising that the

school performance (Hodgkinson, 1991) have prompted educators and policy makers to reform teacher education programs. A critical goal of these reforms is to prepare teachers to teach culturally diverse learners. For this purpose, state departments of education increasingly require colleges and universities to include in their curricula courses on cultural diversity. Presumably, these (and similar) measures will help preservice teachers become more sensitive to the needs of culturally diverse students and equip them to teach this population (Zechner et al., 1996).

Unfortunately, research on the implementation and effects of these efforts is scarce. For instance, Grant and Secada (1990) found that the 16 research studies in this area disseminated before 1990 were limited in conceptual, geographic, and programmatic scope. They reported that most studies (a) were conducted in midwestern states; (b) defined multicultural education as related primarily to race, thus ignoring critical domains in this area of study (e.g., gender, language, socioeconomic status); and (c) focused on individual teacher education programs. Likewise, Grant and Secada reported that most researchers targeted teacher attitude change as the only outcome variable. A small number of studies assessed (in addition to attitudes) teachers' knowledge and/or behaviors. Only four studies assessed preservice teachers' reactions to multicultural education courses. More important, most studies have produced mixed results (Grant & Secada, 1990; McDiarmid & Price, 1990).

Since 1990, however, more studies have been published, and the geographic and conceptual scope of this research has expanded (Bennett, Niggle, & Stage, 1990; Ladson-Billings, 1995; McDiarmid, 1991, 1992, 1993; Rios, Ross & Smith, 1992). Nonetheless, recent studies still tend to be based on a narrow programmatic scope and render mixed results. For instance, Barry and Lechner (1995) reported that, although

Commonly implemented in the form of ethnic studies or women's studies, these programs assume that knowledge about particular oppressed groups should be taught separately from conventional classroom knowledge, in either separate units or separate courses. . . . *Multicultural approaches* to education promote social equality and cultural pluralism. The curriculum is organized around the contributions and perspectives of different cultural groups, and it pays close attention to gender equity. . . . [T]hese approaches build on students' learning styles, adapt to their skill level, and involve students actively in thinking and analyzing life situations. . . . *Education that is multicultural and social reconstructionist* [EMC] extends the previous approaches by teaching students to analyze inequality and oppression in society and by helping them to develop skills for social action. EMC promotes social structural equality and cultural pluralism and prepares citizens to work actively toward social structural equality. (Emphases added)

In their review of the empirical literature, Grant and Secada (1990) concluded that most studies were based on what Slee-ter and Grant defined as a multicultural education approach, though a few studies used a single-group studies model. Similar patterns have been reported recently (Grant & Tate, 1995; Ladson-Billings, 1995).

Second, the decision to select outcome variables is embedded in a particular view of teachers and teaching. We argue that many researchers have used traditional views of teaching and teachers in this area of study. Specifically, given that attitude change has been the modal outcome variable, multicultural education training often seems to have been conducted to "persuade" teachers to use or to pay attention to issues of culture in schools. Thus, the proof of intervention effectiveness has been whether participants were receptive or sympathetic to multiculturalism or if they acquired the content included in the course syllabus. This reflects a rather traditional view of teaching whereby an "expert" de-

majority of studies in this area have reported little change in preservice teachers' attitudes, beliefs, and expectations for culturally diverse students.

In examining the outcome variables of these studies, two important and interrelated conceptual aspects must be considered: the approach to multicultural education, and the definitions of teachers and teaching that underlie this research. These two aspects are of enormous importance in this line of research because they largely determine the nature of the intervention (i.e., the multicultural education course). Unfortunately, little attention has focused on the role of these interrelated aspects.

First, multicultural education has been defined vaguely in research studies (Banks & Banks, 1995; Sleeter & Grant, 1987). Based on an extensive review of the literature, Sleeter and Grant (1994) identified five approaches to multicultural education: (a) teaching the exceptional and culturally different, (b) human relations, (c) single-group studies, (d) multicultural education, and (e) education that is multicultural and social reconstructionist. Grant and Secada (1990, p. 408) summarized the definitions of these approaches as follows:

*Teaching culturally different or exceptional children helps fit people into the existing social structure and culture. Dominant traditional educational aims are taught by building bridges between the students and the school. . . . The emphasis would be on techniques for building the bridges between children and school and for helping students adapt to the norms of the dominant culture. . . . Human relations attempts to foster positive affective relationships among individual members of diverse racial and cultural groups, and/or between males and females, to strengthen student self-concept and to increase school and social harmony. . . . [This approach] prepares teachers to honor diverse student backgrounds and to promote harmony among students. . . . Single-group studies promote social structural equality for, and immed-*iate recognition of, an identified group.

agical, subject-matter, and pedagogical content knowledge (Cochran et al., 1993; Shulman, 1986). Pedagogical knowledge "includes knowledge of theories of learning and general principles of instruction, an understanding of the various philosophies of education, general knowledge about learners, and knowledge of the principles and techniques of classroom management" (Grossman & Richert, 1988, p. 54). Subject-matter knowledge includes an understanding of content of the subject, curricular issues, and materials that are used in this area of study. Finally, pedagogical content knowledge is a more specialized area of teacher knowledge. It includes "an understanding of what it means to teach particular subject matter to students" (p. 54). Teachers' awareness of how to conceptualize and represent content knowledge for teaching, knowledge of student understanding of subject matter, knowledge of their students (how they learn and develop) and "of the particular context and environment in which they work" (p. 54) are central to the notion of pedagogical content knowledge. Hence, teachers construct, transform, and develop these types of knowledge according to their own prior and current experiences and the social context in which they work.

Surprisingly, research on the preparation of preservice teachers for student diversity has tended to ignore the constructivist-based research paradigm. Indeed, with few exceptions (e.g., Artiles & Trent, 1997; Condon, Clyde, Kyle, & Howda, 1993; Powell, 1996; Sutton, Cafarella, Schurdel, & Bichsel, 1996), this paradigm has rarely been used in teacher education research and multicultural teacher education. Hence, the purpose of this study is to contribute to the knowledge base on the preservice preparation of teachers for student diversity. Specifically, we explored the use of two alternative measurement and data analysis procedures to understand the effects of a multicultural education course on preservice teachers' professional development that include several types of knowledge during their preparation. Likewise, teachers construct and refine multicultural development in social cognitive practice as a result of a complex cognitive process that novice teachers refine for it is assumed that novice teachers refine their practice as a result of a complex cognitive developmental process in social contexts (Artiles & Barreto, 1996; Powell, 1996).

Likewise, teachers construct and refine several types of knowledge during their professional development that include pedagogical, subject-matter, and pedagogical content knowledge (Cochran et al., 1993; Shulman, 1986). Pedagogical knowledge "includes knowledge of theories of learning and general principles of instruction, an understanding of the various philosophies of education, general knowledge about learners, and knowledge of the principles and techniques of classroom management" (Grossman & Richert, 1988, p. 54). Subject-matter knowledge includes an understanding of content of the subject, curricular issues, and materials that are used in this area of study. Finally, pedagogical content knowledge is a more specialized area of teacher knowledge. It includes "an understanding of what it means to teach particular subject matter to students" (p. 54). Teachers' awareness of how to conceptualize and represent content knowledge for teaching, knowledge of student understanding of subject matter, knowledge of their students (how they learn and develop) and "of the particular context and environment in which they work" (p. 54) are central to the notion of pedagogical content knowledge. Hence, teachers construct, transform, and develop these types of knowledge according to their own prior and current experiences and the social context in which they work.

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### A Constructivist View of Teachers

Livers information to convince students about the credibility or merit of the content. We contend, therefore, that researchers who study the effects of multicultural education need to broaden their conceptual framework. Moreover, recent developments in educational research have enriched the notions of teachers and teaching. Cognitive paradigms now offer more comprehensive views of teachers' work and their professional growth. Despite these new developments, "we have no maps of how teacher cognitions, beliefs, and skills with respect to the teaching of diverse student populations actually develop" (Grant & Secada, 1990, p. 419). We aimed to contribute to this literature by exploring measurement and data analysis strategies to understand the effects of a multicultural education course on preservice teachers. The study was based on a constructivist view of teachers. An outline of this conceptual perspective is presented in the next section.

### A Constructivist View of Teachers

include all sorts of phenomena under the heading "knowledge," including insights, imaginations, musings, awareness, understandings, recollections, predictions, anticipations, and a host of other activities of mental life. In defining knowledge in this way, we would be making no claims about the epistemic status of these mental states or events or the written or spoken outcomes of these mental activities. In making this distinction, we could preserve the epistemological difference while not denying ourselves a convenient way of categorizing mental events and outcomes that are important to research programs in the field of teacher knowledge.

In this study, we used the notions of knowledge and beliefs as grouping terms. First, we were interested in exploring the use of alternative data analysis strategies (concept maps) to assess changes in participants' representations of an important construct (i.e., effective teaching for culturally diverse students) after participating in a graduate course on multicultural education. Similarly, we were interested in assessing how participants used the content from the course to depict graphically their understandings of the aforementioned construct. Moreover, using previous empirical work (Artiles et al., 1994; Morine-Derthimer et al., 1992), we assumed that people's graphic representations of constructs via concept maps mirror their knowledge.

This approach transcends the traditional assessment of attitude change because it focuses on how preservice teachers use theory and research findings studied in the course to transform their knowledge about good teaching for culturally diverse students. From this perspective, the merit of this approach resides in the examination of teacher knowledge in order to understand preservice teachers' learning-to-teach processes in multicultural contexts. Because a theory of teachers as learners is gaining momentum in this field of inquiry, the focus of this qualitative study is critical. Although qualitative

knowledge and beliefs about teaching culturally diverse students. The research questions we aimed to answer were:

1. Are there changes in preservice teachers' knowledge and beliefs about teaching diverse learners after enrolling in a multicultural education course?
2. What can be learned from the analyses of concept maps and surveys regarding the effects of a multicultural education course on preservice teachers' knowledge and beliefs?

### Basic Constructs and Assumptions

Educational researchers have debated for years about the definitions of knowledge and beliefs, though "specific understandings of these concepts remain elusive" (Alexander & Dochy, 1995, p. 414). In fact, the vague use of these terms in the teacher thinking research tradition has been criticized (Kagan, 1990). For some investigators, the two constructs are synonymous, whereas for others they are conceptually distinct notions. Yet, other researchers construe beliefs as a form of knowledge. Interestingly, the opposite has also been proposed (i.e., knowledge is a type of belief). Despite the lack of consensus in differentiating these constructs, "the chosen and pertaining artificial distinction between belief and knowledge is common to most definitions: Belief is based on evaluation and judgment; knowledge is based on objective way to distinguish these two important constructs:

Given what appears to be a growing tendency in the educational research literature to discuss knowledge and beliefs as if the terms were synonymous, there is much to be gained from making a distinction between using knowledge as a grouping or classifying term, on the one hand, and using it to imply or entail the relative epistemological merit of one's claims, on the other. When used as a grouping term, we may, with impunity,

There was one male student in Group B ( $N = 7$ ), and the group's ethnic composition included three Chicanas and four white students. Their undergraduate degrees were in sociology (1), psychology (1), liberal studies (1), Spanish (1), Latin American studies (1), and hotel administration (1). Their average undergraduate GPA was 3.52 (range = 3.10-3.99).

Su (1996) gathered extensive demographic data from the same group of students. She found that, compared to their white counterparts, minority candidates came from a lower socioeconomic status and relied more on financial assistance to support their studies. Minority candidates' parents also had lower educational attainment, though there were no differences between white and minority parents' expectations for their children's education.

#### The Multicultural Education Course

The goals of the course, as stated in the course syllabus, were (a) to develop a conceptual framework to understand and deal with cultural differences and (b) to become aware of the personal component that is involved when one deals with issues of cultural difference. The first author taught the course in the first 5 weeks of the quarter so that students could conduct observations in schools and start the transition to their student teaching during the second half of the quarter. Students attended class 2-3 hours, three times a week, for a total of 40 in-class hours.

The course was based on a sociocultural view of human diversity that included beliefs, values, frames of reference or world-views, gender, socioeconomic status, ethnicity, race, and language as constituent elements of culture (Banks & Banks, 1993). The course was designed to provide participants with information about multicultural education and to promote reflection about the meaning that cultural diversity had in their own lives (i.e., to become aware of their own assumptions, definitions, expect-

studies can be criticized for their small sample size and particularity, qualitative researchers and theorists argue that these studies' "depth allows for questions, insights, and perspectives useful in other, related contexts" (Grant, Peterson, & Shogren-Downer, 1996, p. 536).

Second, we were also interested in exploring the use of an alternative measurement strategy (i.e., surveys) to assess changes in preservice teachers' perspectives about culturally diverse students and about teaching after completing the course on multicultural education. We used these reports as a proxy of their beliefs because they reflected their inclinations or opinions about several aspects of education (e.g., diverse pupils, teaching strategies). Note that teachers did not justify these reports by any kind of evidence. Participants merely expressed their views on the issues under scrutiny.

#### Method

##### Participants and Context

Seventeen preservice teachers enrolled in a required multicultural education course participated in this study. There were 16 females and one male in the student sample. Participants constituted a subgroup of a larger cohort of students enrolled in the course. The selected students were categorized into Group A and Group B. A description of the criteria used to categorize the study groups is presented in a subsequent section. The multicultural education course was offered in the winter quarter of 1994. Participants were pursuing M.Ed.s and credentials in elementary education.

All students in Group A were female ( $N = 10$ ). There were five white, two Chicana, two Asian, and one Filipino student in this group. Their undergraduate degrees were in psychology (3), English (2), sociology (1), anthropology (1), business (1), and communications (1). Their average undergraduate grade point average (GPA;  $A = 4.0$ ) was 3.65 (range = 3.21-4).

cillitate the discussion, reflection, integration, and application of course content. Typically, the first hour of class was devoted to a review of the assigned readings. The instructor summarized the information from the readings and stressed major concepts. He also led whole-class discussions on the readings, addressed questions, and promoted student involvement in the discussion. Next, groups of students made presentations on selected topics assigned at the beginning of the course. Some of these topics included communicating across cultures, expanding educational boundaries, gender issues, and the transformation of curriculum and pedagogy. Groups were expected not only to summarize major concepts related to these topics but also to engage the rest of the class in hands-on activities in which they applied the discussed constructs.

Groups were creative in the means they used to elicit their peers' participation and the ways in which they applied theory to classroom instruction. For example, one group led a discussion on how to broaden the boundaries of education through the inclusion of parents, neighborhoods, and communities. They presented several concepts that were central to their model and then showed an example in which a teacher studied the demographic data and the geographic characteristics (i.e., how residences, social agencies, recreational areas were laid out) of the neighborhood and community in which her school was located. She then used these data to capitalize on community resources and funds of knowledge to make instruction more relevant to her students' lives. Likewise, guest lecturers (faculty, doctoral students) presented research findings on topics related to multicultural education. For instance, a doctoral student discussed his research on building a community of learners in a first-grade classroom from a critical perspective. He showed videotapes of lessons and analysis of classroom discourse to document the

tations, views, and attitudes toward cultural diversity). This emphasis was consistent with the teacher education program's definition of teachers as reflective practitioners who use their knowledge during the preactive, interactive, and postactive phases of teaching.

A conceptual framework in which socio-cultural variables shape and mediate human development was presented in the first week of class. Furthermore, a contextualized view of human development was stressed throughout the course. In this view, the influence of sociocultural factors on pupils' learning must be understood in the unique contexts in which pupils live and learn. In addition, the role of power in social interactions and the asymmetrical relations power differentials can create among interactants were also important ideas stressed throughout the course. Hence, a view of teachers as critical inquirers and as agents of change in schools was emphasized in class discussions and assignments.

This teacher education program is based on an interdisciplinary model of educational research, and it is committed to urban education and social justice. Thus, critical theory was an important (but not the only) theoretical framework used in this course (e.g., feminist and sociocultural theories were also reviewed and discussed in class). In addition, the course was based on the notion of multicultural education as articulated by Banks and Banks (1993) and by Cushman, McClelland, and Safford (1992). Based on the typology of the multicultural education literature developed by Sleeter and Grant (1994), this course would be classified under the multicultural education approach. Nevertheless, important elements of the "education that is multicultural and social reconstructionist" model were included in the course.

Lectures, guest speakers, films, group discussions/reports, case-study analyses, and laboratory activities were used to fa-

Other processes of change in this classroom. Guest presenters used case studies to elicit discussions and analyses about the role of sociocultural factors in students' lives (e.g., gender issues).

Class time was also devoted to group tasks that aimed to raise awareness among participants about issues related to cultural diversity. For instance, groups discussed an article in which a teacher reported how she managed disagreements among students and between students and herself when analyzing the Holocaust. Similarly, students discussed in small groups a series of questions about their own ethnicities and cultural backgrounds and the role cultural diversity had played in their lives. Course assignments included (a) a report on an 8-hour interaction with (or observation of) a person (or setting) of a different culture, (b) a group report on a semistructured discussion about a set of readings, (c) a written analysis of curricular materials from a multicultural perspective, and (d) a theoretical analysis of a debate about racism that had been published recently in the university newspaper.

In conclusion, the most important anticipated outcome was that prospective teachers would leave this course with an enhanced view about the education of diverse students. In this view, these students would emphasize not only the role of pedagogical knowledge (e.g., instructional strategies), but also the importance of their own perceptions, attitudes, and beliefs; the role of sociocultural variables in human development; the role of power in school settings; and the need to act as critical inquirers and agents of change in schools.

Numerous aspects of this course contradict popular notions about the performance of culturally diverse students in educational contexts. For instance, traditional analyses have ascribed diverse learners' academic difficulties to their own deficits and limitations. Little attention has been given to the mediating role of the social context of situations. Little attention has been given to the difficulties to their own deficits and limitations. For instance, traditional analyses of culturally diverse students in educational contexts. For instance, traditional analyses have ascribed diverse learners' academic difficulties to their own deficits and limitations. Little attention has been given to the mediating role of the social context of situations.

The three primary components of this teacher education program are the M.Ed. coursework, the credential course sequence, and the curriculum that emphasizes cultural diversity and bilingual education. The

The teacher education program is housed at a public university located in the western United States. Typically, about 150 students enroll annually in this program. (The program has been restructured substantially since this research was conducted; thus this program description is accurate through the 1994-1995 academic year.) The program offers an opportunity for graduate students to obtain both a master of education degree and a teaching credential in a full-time, 1-year program. The curriculum integrates researched-based instructional methods with classroom practice. The minimum grade point average for admission to the program is a cumulative 3.0 ( $A = 4.0$ ) in the junior and senior years of undergraduate work. Other considerations include the quality and competitiveness of the undergraduate institution, the relevance of previous coursework, and performance in academic courses. Preprofessional experience and letters of reference are also considered during the admissions process.

#### The Teacher Education Program

Thus, it is not surprising that some preservice teachers tend to regard the multicultural education discourse as controversial, particularly because of critical theorists' emphasis on the political dimension of teachers' work. In fact, teacher resistance has been documented in the context of multicultural teacher education (Ahlquist, 1992; Cross, 1993; Solomon & Levine-Rasky, 1995). Reportedly, some participants in this study expressed strong dissenting views during class discussions and disregarded the views examined in this course. However, we did not assess teacher resistance in this study. Thus, this variable was not used to select the study sample or to analyze the data.



M.Ed. coursework covers such subjects as cultural foundations of education, instructional decision making, and curriculum development through advanced graduate studies. The credential course sequence assists in the development of instructional strategies and pedagogical skills. Students receive teaching experience in local urban districts. The credential component of the program has two options, a multiple-subject instruction credential for elementary school teachers or a single-subject instruction credential for secondary school educators. The participants in this study were enrolled in the former, which is designed to prepare educators to teach in elementary grades.

Finally, as mandated by the state's department of education, the specialized curriculum equips students with appropriate strategies for teaching culturally diverse learners, including bilingual resources and training. There are two areas of emphasis in the specialized curriculum. All students are exposed to an area on cultural diversity. This emphasis prepares a teacher to provide instruction for English language development and specially designed instruction in academic subjects that is delivered in English. There is also an area of emphasis on bilingual education. This emphasis prepares a teacher to provide the same instruction in addition to providing methods for primary language and content instruction delivered in Spanish.

Students move through the program in a cohort. The sequential design of the program requires that students complete all components over the course of 1 academic year and 2 summers and that all work be conducted at this university. Students are enrolled full-time and are required to maintain a minimum cumulative GPA of 3.0. Students must complete two student teaching assignments. The instructors in the program include faculty and staff with extensive and extensive experience in distinct areas (e.g., curriculum, teaching studies, cultural diversity). Staff members are professionals with doctoral degrees who serve as coordinators, doctoral students with extensive teaching experience who act as field supervisors, and experienced teachers with advanced degrees (from local school districts and research units/organizations in the area) who teach methods courses.

#### Instruments

Two measurement strategies—concept maps and surveys—were used to explore what teacher educators can learn about the effects of a multicultural education course. *Concept maps.* Concept maps were used to assess conceptual changes in preservice teachers' representations of effective teaching for culturally diverse students. Concept mapping "is a procedure developed for tracing conceptual change that has been used in several studies of teacher education" (Mortine-Dershimer, 1993, p. 15). Concept maps are useful and sensitive tools to assess conceptual change in preservice teachers and to measure how individuals organize their knowledge (Beyerbach, 1988; Jones & Vesilind, 1996; Mortine-Dershimer et al., 1992; Novak & Gowin, 1984). However, concept maps have not been used to assess effects of multicultural education courses.

Jones and Vesilind (1996) contended that concept mapping "is a powerful and psychometrically sound method for assessing conceptual change. . . . Concept mapping has been described as particularly useful for constructivist teachers and researchers who seek insight into how individuals construct their own idiosyncratic concepts" (p. 93). Although data on the reliability of concept maps have not been reported, it can be expected that—consistent with a constructivist view of learning—informants' maps are transformed over time as a result of their learning experiences in sociocultural contexts.

*Beliefs survey.* A survey published by the National Center for Research on

Teacher Learning (Michigan State University) to assess preservice teachers' beliefs about culturally diverse students was used in this study (McDiarmid & Price, 1990). The survey contains 31 questions on career plans and views on issues of learning and teaching culturally diverse students (e.g., teacher roles, planning, grouping, instruction, and evaluation) (see App. A). The survey questions contain a variety of formats that include a Likert scale, item ranking, and multiple-choice questions. This instrument has been used in previous multicultural preservice teacher education studies (McDiarmid & Price, 1990; Trent, Pernel, & Stephens, 1995).

#### Data Collection and Analysis

*Concept maps.* Concept maps were constructed in class during the first and last sessions of the course. Participants were asked to construct a concept map on "Effective Teaching for Culturally Diverse Students." Standardized instructions and examples used in previous studies (Morine-Dershimer et al., 1992; Saunders & Tankersley, 1990) were presented to participants when they constructed the maps before and after the course (see App. B for a sample concept map). Furthermore, it should be noted that, unlike others who have conducted concept map studies, we did not compare teachers' concept maps against a "standard map" (i.e., we did not have a preestablished definition of effective teaching for diverse learners). Researchers who have used a rubric to compare subjects' maps have been criticized for assuming the existence of an "incontestable exemplary structure" (Kagan, 1990, p. 450).

In contrast, congruent with a constructivist theory of learning and the qualitative inquiry tradition, we used an inductive approach to examine how participants constructed and transformed their knowledge of good teaching for diverse students after taking a specialized course. Although descriptions of effective teaching for diverse learners have been reported elsewhere (Franklin, 1992; Gersten, Brengelmann, & Jimenez, 1994; Zeichner & Hoeft, 1996) and several principles and strategies of good teaching were identified during the course, we were interested (a) in studying how preservice teachers used this information to transform their own knowledge and (b) in understanding how various measures might reveal this process of cognitive transformation. Moreover, we explored alternative ways to analyze the concept map data to ascertain changes in preservice teachers' cognitions. We followed a two-step process to analyze the maps. This process allowed us to examine changes in individuals as well as groups of participants.

*Assessment of individual patterns.* First we analyzed maps to discern changes in individual students' conceptualizations. For this purpose, we calculated the density of concept maps following a standard procedure (Morine-Dershimer, 1989). The density measure takes into account the structural characteristics of maps, "including the number of main categories and the number of levels to which categories were developed" (Morine-Dershimer, 1989, p. 47) (see App. B for a sample calculation).

Transformations in the density of concept maps across time have been interpreted as reflections of changes in conceptual understanding (e.g., greater density has been associated with increased conceptual understanding; Morine-Dershimer, 1989). However, we do not possess information on the meanings of density changes in the type of study reported here because, as far as we can determine, this is the first time such an analytic tool has been used to assess the effects of a multicultural education course. Thus, we cannot assume that greater density means greater understanding and vice versa. For instance, it is feasible that a "simplistic conception of the topic can result in low density, but a reorganized, more elegant rendering of an earlier conception can also result in low density" (Morine-

cepts signaled conceptual changes, especially reorganization of concept hierarchies. Likewise, they inferred knowledge acquisition when changes in superordinate concepts and hierarchies were observed. In addition, we were interested in examining the constructs that preserve teacher groups emphasized in their conceptualizations of good teaching for diverse learners. This analysis would allow us to enhance our understanding of the distinct patterns of cognitive transformations. Thus, a qualitative category system was developed to code the content of the maps. Next, the centrality and specificity of these qualitative categories were calculated to assess group emphases. Finally, we used a systematic procedure to chart groups' changes and shifts in emphasis by categories. A description of these procedures is presented next.

We assumed that the ideas/constructs that were first introduced (i.e., connected directly to the central concept) in these maps were the organizing concepts in students' conceptualizations (we called it a "centrality" measure; Morine-Dershimer, 1993). We also wanted to determine how much specificity they provided to each of the constructs included in their conceptualizations. We assumed that more detailed reflected greater familiarity with the construct, though this did not necessarily mean that the construct had greater organizing importance. For example, a preservice teacher might place the notion of "teaching for understanding" as an organizing (i.e., superordinate) construct to define "good teaching." Thus, this would give a low centrality value to this construct—note that lower centrality values mean greater organizing relevance. Yet she might not be familiar enough with this notion to include more items below this construct, which would result in a low specificity value. In practice this might mean that, although a teacher is aware of the importance of teaching for understanding, her lack of familiarity with such a construct would limit the number of

Dershimer, e-mail, June 20, 1996; emphasis in original). Hence, because of the semingly context-specific meaning of the density measure, we used it only as an initial and gross quantitative indicator of change in individual students' conceptualizations. It was apparent, however, that additional information was needed to interpret the meaning of the density measure. Therefore, we used several additional strategies to analyze concept maps. These procedures allowed us to assess conceptual changes in groups of students.

*Assessment of group emphases.* In the second step in our exploratory data analysis, we aimed to supplement the information on the changes identified in the previous analytic step for groups of students. For this purpose, we examined the degree of differentiation, the degree of hierarchical organization (Beyerbach, 1988), and the nature of map reorganization (Jones & Vesilind, 1996). These criteria are relevant to the scoring of concept maps because they are based on learning theory constructs (Novak & Gowin, 1984). Beyerbach (1988) coded in concept maps the degree of differentiation (i.e., number of discrete entries included on a map) and the degree of hierarchical organization (i.e., the largest number of subordinate levels in a map) to assess conceptual growth. Based on previous evidence, she argued that "concept development involves increasing differentiation among concepts and increasing hierarchical organization" (p. 341).

Moreover, consistent with Jones and Vesilind's (1996) approach to discern the nature of map reorganization, we "examined superordinate concepts as well as concepts added and deleted" (p. 96). "The simultaneous loss and gain of concepts suggest evidence of rapid cognitive reorganization" (p. 99). Superordinate concepts were the highest constructs included in a hierarchy—in other words, those connected directly to the map's central hub. These authors reported that changes in superordinate con-

examining the categories that groups of teachers emphasized before and after the multicultural education course. We followed the procedures created by Morine-Dershimer (1993, p. 17) to calculate concept maps' centrality and specificity of constructs:

Centrality was determined by the level at which the category was first introduced on the map (i.e., proximity to the central concept). Degree of specificity was determined by the proportional frequency of items associated with the category (number of items in the category divided by the number of items on the map). . . . *Because the emphasis was on determining group measures, it was essential to have a measure for each category for every student. A "weighted" measure of centrality was used for categories that were not included at all on a given map. . . . The weighted measure of centrality was counted as being two levels below the*

strategies she could use to promote pupils' understanding. Hence, an assumption of this analysis is that the constructs that are both central and specific in teachers' conceptualizations have greater significance in teachers' knowledge and practice. In addition, it can be inferred that it is equally important to report both the centrality and specificity of constructs to gain a better understanding of their prominence in groups' conceptualizations.

Thus, we conducted a content analysis of concept maps and developed a category system (see Table 1). The category definition system were refined as the coding procedures evolved throughout the data analysis process. Coders compared their individual classifications and resolved any differences in categorization. After maps were coded, the centrality and specificity of categories were calculated. We were interested in ex-

TABLE 1. Category System Used to Code Concept Maps

Categories	Subcategories	Areas/Examples
Curriculum issues	Goals	Objectives for the year Individualized Educational Plans Reading, science, poetry, issues of oppression Books, movies, people, computers
Instructional issues	Classroom management	Pupil behavior Physical organization Class climate
	Instructional processes	Teacher- or pupil-centered teaching strategies Teaching approaches, models, or theories Out-of-class instructional strategies
	Evaluation and feedback	Modes of assessment (observations, essays) Physical, emotional, cognitive, motivational characteristics Integrate subjects Appreciate diversity Awareness Knowledge of research Consultation with colleagues Parent roles School policies School ethos School/district policies
Social context issues	Student characteristics/ background Teacher beliefs/principles	Professional issues Family/parental involvement Systemic issues

small number of cases to report the results of the beliefs survey. Specifically, 10 Group A participants completed the survey before the course, and six returned the survey after the course, and four students submitted the presurvey, and four students completed the postsurvey. For this reason, survey results should be interpreted cautiously. Our goal is merely to highlight group trends.

## Results

### Conceptual Change in Individuals: Map Density Patterns

Two subgroups were identified based on the density scores in participants' concept maps. Although there were changes in the map complexity of all students enrolled in the course, these two subgroups showed clear and distinct patterns of map density before and after the course. Group A's students ( $N = 10$ ) had higher density scores than their counterparts at the beginning of the course (i.e., all individual density scores were  $\geq 4$ ; mean = 5.36, range = 4-7.67). Interestingly, these students decreased the density of their maps after the course (mean = 3.29, range = 2.27-5.00). Students in Group B ( $N = 7$ ) had lower density scores than their counterparts at the beginning of the course (i.e., all individual density scores were  $< 4$ ; mean = 3.11, range = 2.46-3.78), and they increased the density of their maps at the end of the course (mean = 4.39, range = 3.54-5.08).

### Conceptual Change in Groups

Group A members crafted more differentiated maps before the course as reflected in the number of items included in their concept maps (see Table 2). Interestingly, consistent with the changes in density scores, Group A students constructed less differentiated maps after the course. Group B students exhibited the opposite pattern. Moreover, the levels of hierarchical organization (i.e., the largest number of levels in

furthest level existing on the map (essentially this meant "off the map"). (Emphasis added)

In addition, consistent with the importance given to centrality and specificity of categories, we used a grid system created by Morine-Dershimner (1993) to analyze concept map data from groups in order to depict shifts in emphasis by categories. We used the group means on both centrality and specificity to construct these grids. Hence, the grids show not only how central each category was for the group of participants but also how much detail was provided for each category. The categories that were more important to the central notion of effective teaching for diverse learners are depicted on the left half of the grids. Likewise, categories that were presented with more detail (i.e., specificity) appear in the upper half of the grids. Thus, this system created a grid where the upper left quadrant contains the categories that preservice teachers construed as more prominent and about which they could provide a great deal of detail, whereas the lower right quadrant depicts the categories that these teachers knew less about and saw as less central. Grids were created for each group of participants for both the pre- and postconcept maps. To highlight group emphases, we depict only categories that obtained a group mean centrality  $\leq 4.5$  (i.e., categories with greater organizing relevance). Thus, results are described and discussed for these categories only.

### Beliefs surveys. Surveys were distributed the first and last (fifth) weeks of class.

Students responded to the surveys at home. Thus, not everyone returned the completed instruments. Responses to survey questions were summarized with descriptive statistics. Group means were calculated to describe group patterns. We should note that because participation was voluntary throughout the study, some students completed the surveys at the beginning but not at the end of the course. Thus, we used a

Table 2. Concept Maps' Density, Differentiation, Hierarchical Organization, and Reorganization for Groups A (N = 10) and B (N = 7)

	Group A		Group B	
	Premap	Postmap	Premap	Postmap
Density scores	5.36	3.29	3.11	4.39
Degree of differentiation <sup>a</sup>	47.50	44.40	37.60	48.00
Degree of hierarchical organization <sup>b</sup>	3.60	3.20	3.70	3.70
Nature of the reorganization <sup>c</sup>	3.20	4.14	4.14	4.14
Number of superordinate concepts lost	3.20	5.90	4.14	2.43
Number of superordinate concepts gained	4.30	6.10	4.30	2.86
Total number of changes	4.30	6.10	4.30	5.29

<sup>a</sup>Degree of differentiation was defined as the total number of items on a map (Beyerbach, 1988).

<sup>b</sup>Degree of hierarchical organization was defined as a map's largest number of levels (Beyerbach, 1988).

<sup>c</sup>The nature of the reorganization was assessed using Jones and Vesilind's (1996) approach, in which changes in maps' superordinate concepts are analyzed.

gest that, although Group A students seemed to have less complex conceptualizations of "effective teaching for culturally diverse learners" after the course (as reflected in lower density, degree of differentiation, and hierarchical organization scores), they also seemed to be more actively engaged in the rearrangement of the very organizing notions that defined effective teaching.

We now turn to the analysis of the qualitative categories included in these maps to shed light on these complex patterns of cognitive changes. As stated above, map items were coded according to a qualitative category system. We also calculated the centrality and specificity of each category before and after the course for both groups of students (see Tables 3 and 4).

Centrality and Specificity of Qualitative Categories

*Group A premaps.* Group A premaps reflected an interesting pattern (see Fig. 1). First, the organizing constructs these students used to craft their maps seemed related to curricular issues (as reflected in the low centrality score). Specifically, constructs were concerned with subject-matter, topical, and material aspects of teaching

a map) in both groups' maps were almost the same before the course. However, Group B students did not change their mean level of hierarchical organization after the course, whereas Group A students slightly decreased the number of levels in their postmaps (see Table 2).

Furthermore, we found an intriguing pattern in the nature of map reorganization as measured by changes in maps' superordinate concepts. Despite the higher density and greater differentiation in Group A's concept maps before the course (as compared to Group B), these students had fewer organizing concepts in their premaps. In addition, although the density of Group A maps decreased after the course, the number of organizing constructs increased considerably in their postmaps. Meanwhile, the number of superordinate concepts in Group B postmaps (in which density and degree of differentiation increased after the course) remained the same. More important, the analysis of superordinate concepts lost and gained in the postmaps indicated that Group A's students had more changes (see Table 2).

All of these indicators have been used in previous studies to assess conceptual change. The patterns described above sug-

TABLE 3. Mean Centrality Scores\* for Group A (N = 10) and B (N = 7) Students before and after the Course

Categories/Subcategories	Before the Course		After the Course	
	Group A	Group B	Group A	Group B
Curriculum issues:	4.3	3.8	2.5	3.9
Goals	2.9	4.3	4.0	4.7
Content	3.1	2.4	2.1	4.2
Instructional materials/resources	5.1	4.3	4.0	5.3
Instructional issues:	3.6	3.3	3.5	3.8
Classroom management	4.2	4.9	4.1	5.7
Instructional processes	5.4	4.3	2.8	4.8
Social context issues:	5.5	3.9	4.2	4.4
Student characteristics	3.3	2.8	3.0	2.7
Teacher beliefs/principles	4.8	3.4	3.9	3.2
Professional issues	5.7	5.3	4.3	4.6
Parental involvement	4.8	3.4	3.9	3.2
Systemic issues	5.7	5.3	4.3	4.6

\*Centrality was determined by the level at which the category was first introduced on the map (i.e., proximity to the central concept) (Mortine-Dershimer, 1993, p. 17). Thus, more central constructs have lower scores.

TABLE 4. Mean Specificity Scores\* for Group A (N = 10) and B (N = 10) Students before and after the Course

Categories/Subcategories	Before the Course		After the Course	
	Group A	Group B	Group A	Group B
Curriculum issues:	.04	.06	.15	.08
Goals	.06	.06	.007	.01
Content	.08	.09	.07	.03
Instructional materials/resources	.023	.04	.03	.02
Instructional issues:	.44	.30	.24	.25
Classroom management	.05	.02	.014	.00
Instructional processes	.01	.02	.07	.04
Social context issues:	.26	.30	.35	.34
Teacher beliefs/principles	.01	.07	.02	.06
Professional issues	.01	.04	.01	.06
Parental involvement	.008	.03	.04	.11
Systemic issues	.01	.01	.01	.06

\*Degree of specificity was determined by the proportional frequency of items associated with the category (number of items in the category divided by the number of items on the map) (Mortine-Dershimer, 1993, p. 17). Thus, greater specificity values mean that more items were included in a map.

(i.e., content and instructional materials/resources issues). Interestingly, members of Group A did not provide much detail to these constructs. Group A students also emphasized social context aspects in the form of principles of good practice (i.e., teacher beliefs/principles), and (compared to the curricular issues) they provided more detail to these notions (as reflected in the specificity score). In fact, this category was placed close to the first quadrant of the grid (see Fig. 1), which represents the area for the categories most emphasized. The category "teacher beliefs"

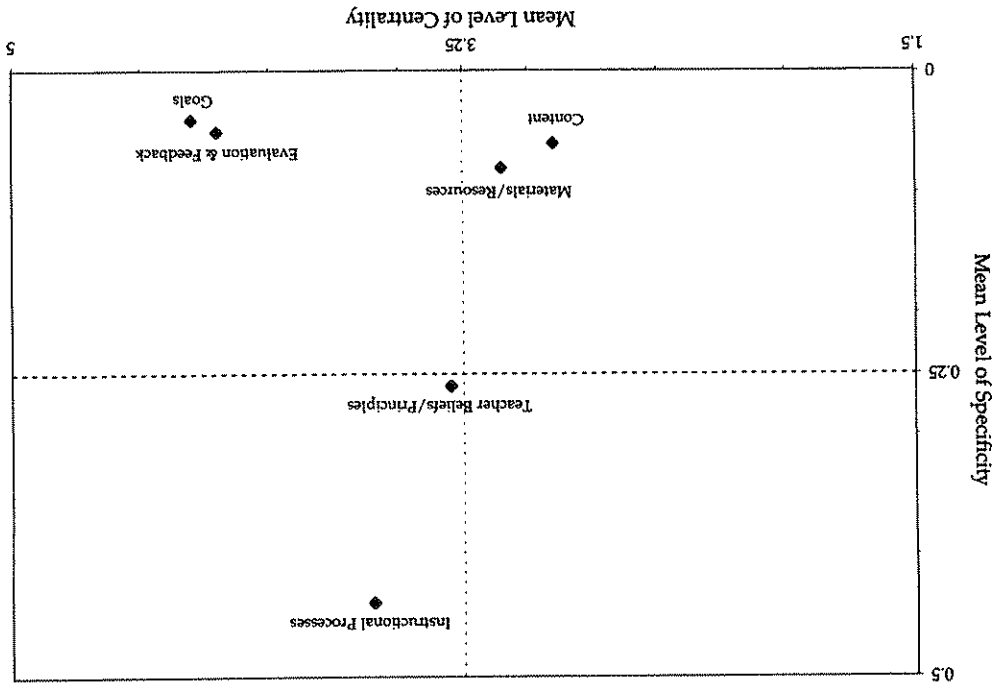


FIG. 1.—Patterns of centrality and specificity in Group A's preconcept maps (N = 10)

participants seemed to be familiar with these constructs, they did not use them as pivotal organizing notions. The categories "Evaluation and Feedback" and "Goals" had a less prominent place in this groups premaps (see Fig. 1).

**Group A postmaps.** Several important changes were observed in the emphasis given to distinct categories in Group A postmaps. After the course, Group A teachers gave great value to social context issues in the form of teaching principles ("Teacher Beliefs/Principles") when defining good teaching for diverse pupils. This category was the most relevant to these teachers as reflected in its place on the grid (i.e., the first quadrant; see Fig. 2). Notably, these teaching principles mostly focused on attitudes or qualities that educators should possess when teaching diverse students.

Moreover, these preservice teachers thought that other issues related to social context and curriculum were still critical to good teaching for diverse students. Note

reflects value statements that teachers embrace as guiding principles when teaching diverse students (e.g., "sharing of cultural knowledge"). Moreover, this category could be further classified as attitudinal or instructional. Attitudinal items stressed teaching principles related to attitudes/qualities that a teacher should possess (e.g., a caring attitude). In turn, instructional items focused on principles of practice that have a direct bearing on instruction (e.g., the need to integrate subjects). Group A students tended to emphasize teaching principles that embodied attitudinal aspects. It should be noted that teaching principles for diverse students were emphasized heavily during the multicultural education course. Moreover, the category of "Instructional Processes," which was presented with considerable detail, was less central in this group's maps. Students in Group A emphasized instructional processes in the form of methods that can be used in the classroom and that are pupil-centered. Thus, although



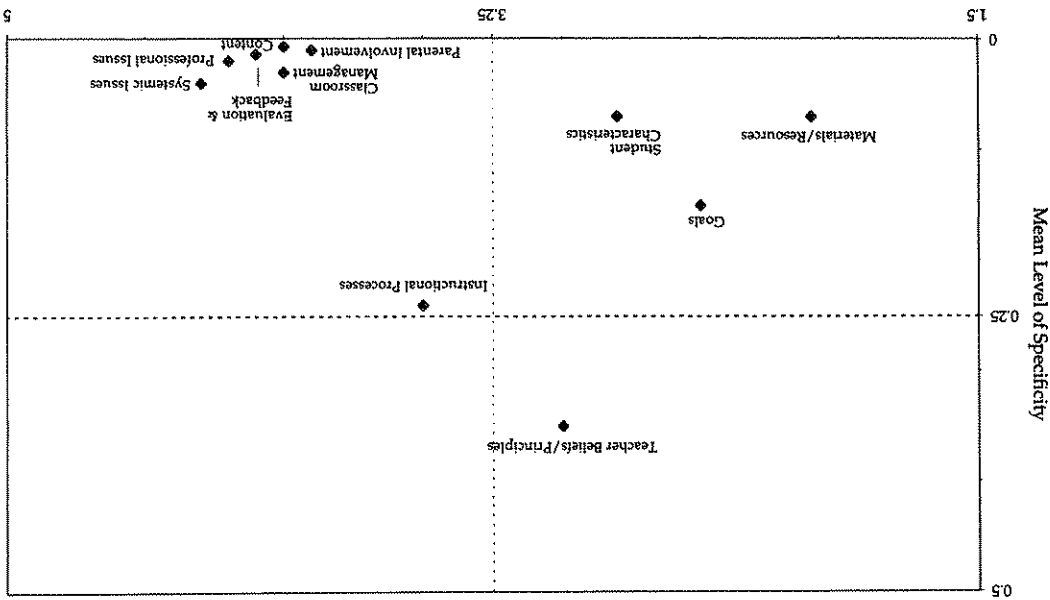


FIG. 2.—Patterns of centrality and specificity in Group A's postconcept maps (N = 10)

that several shifts in emphasis were noted within each of these two larger categories. For example, these teachers considered instructional materials an even more central aspect of good teaching. In contrast, content issues became less relevant; instead, the role of teaching goals became prominent in their conceptualizations of effective teaching. Similar to their conceptualizations before the course, Group A teachers used these curricular aspects as organizing constructs in their maps but gave them little detail (see Tables 3 and 4 and Fig. 2).

Another interesting change was the emergence of emphasis in a new social context category, student characteristics/background. This is consistent with the emphasis used in the multicultural education literature used in the course, which stressed certain marker variables that characterize culturally diverse students (e.g., race, language background, socioeconomic status). Similarly, the literature identified student emotional, cognitive, and motivational characteristics (e.g., learning styles) that should be taken into account when teaching

diverse students. However, an approach in which isolated marker variables are emphasized was thoroughly criticized in the course. Interestingly, although Group A teachers still elaborated on the role of instructional issues (e.g., instructional processes in the form of educational models and instructional strategies), they offered fewer details about these issues. For example, the original emphasis on pupil-centered instructional methods decreased considerably after the course. These teachers elaborated the most about educational models/theories at the end of the course (see Table 3). This shift is not surprising given that in the multicultural education course students closely examined theories and educational models.

Other categories that received less attention were related to social context (parental involvement, professional issues, systemic issues), curriculum (content), and instructional issues (evaluation and feedback, classroom management) (see Fig. 2). Finally, note that the number of categories most relevant to these teachers' concep-

alliations (i.e., those with centrality values  $\geq 3$ ) increased from one category to four categories at the end of the course.

**Group B premaps.** Before the course, preservice teachers in Group B defined effective teaching for diverse students as related to social context and curriculum issues (see Fig. 3). Specifically, these teachers identified social context issues (i.e., teacher beliefs/principles) as the most important element in their conceptualizations of effective teaching, with an emphasis on instructional aspects. Curricular issues (i.e., materials and resources) were also another important organizing construct emphasized in these premaps, though with less detail than the teacher beliefs/principles category.

In addition, Group B teachers were fairly specific about constructs related to instructional processes, particularly in regard to in-class pupil-centered instructional methods. Nevertheless, ideas about instructional processes were not as central as the aforementioned categories (see Fig. 3). Furthermore, Group B teachers defined good teaching for diverse pupils as mostly related to social context issues (i.e., teacher beliefs/principles; see Fig. 4). Similar to the premaps, these teaching principles stressed instructional issues. Another social context subcategory (i.e., "Parental Involvement") was the second most central construct in these postmaps. However, Group B students hardly elaborated on this construct.

Furthermore, although less central than the social context ideas, instructional (i.e., instructional processes) and curriculum issues (i.e., goals materials/resources) were also included in these postmaps. However, instructional processes constructs became less important and less specific after the course. The ideas about instructional pro-

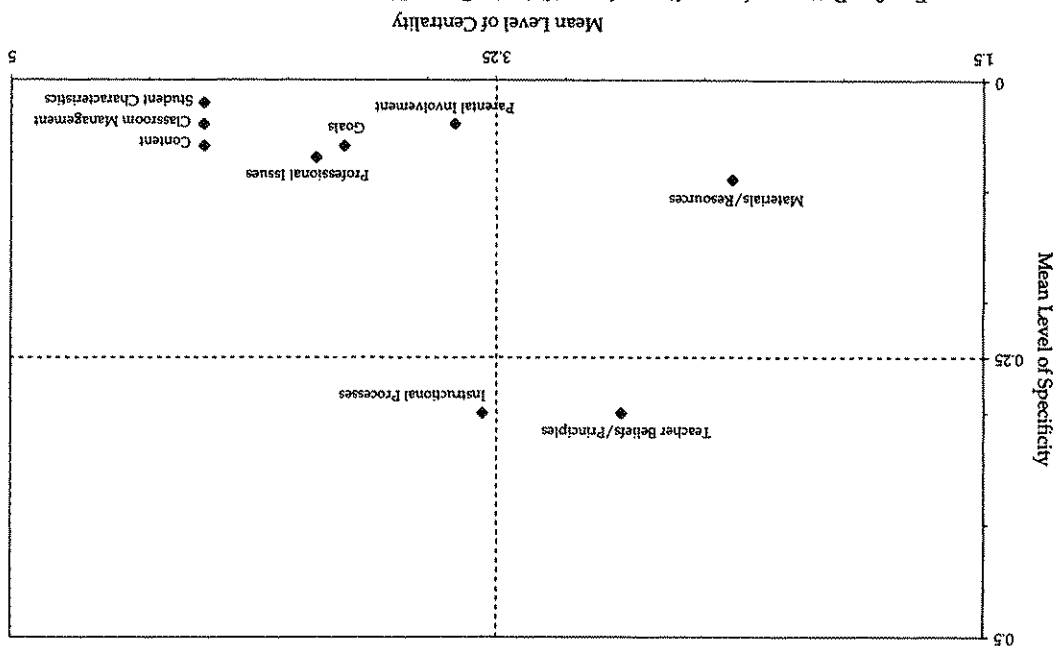


FIG. 3.—Patterns of centrality and specificity in Group B's preconcept maps ( $N = 7$ )

JANUARY 1998

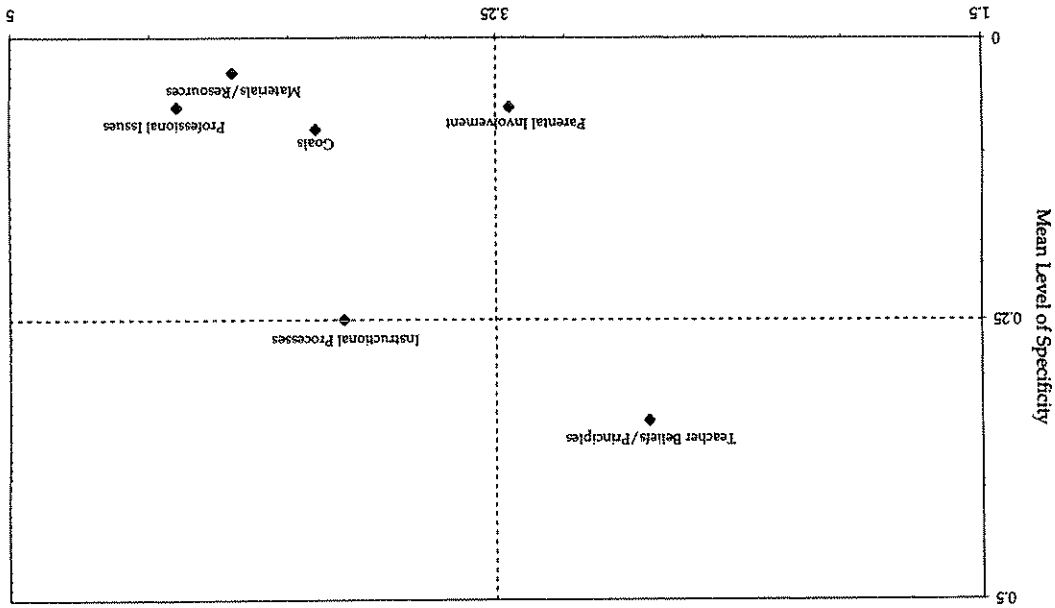


FIG. 4.—Patterns of centrality and specificity in Group B's postconcept maps (N = 7)

cesses that were most elaborated on were related to models/theories. Interestingly, the most central ideas related to instructional processes shifted from *pupil*-centered methods in the premaps to *teacher*-centered instructional methods after the course. Similarly, Group B students did not emphasize several constructs that were relevant in their first conceptualizations of good teaching for diverse students. Most notably this includes instructional materials/resources, which was the most central category in the premap. Finally, in contrast to their counterparts, the number of categories with greater centrality (i.e., scores  $\leq 3$ ) decreased from two categories to one category after the course.

**Belief Changes**

*Similarities between groups.* All students expressed a consistent intent to teach in public schools, and the majority (75%; N = 13) indicated that they planned to teach in urban schools. The two groups also had similar ideas concerning their roles as teachers that were most elaborated on were related to models/theories. Interestingly, the most central ideas related to instructional processes shifted from *pupil*-centered methods in the premaps to *teacher*-centered instructional methods after the course. Similarly, Group B students did not emphasize several constructs that were relevant in their first conceptualizations of good teaching for diverse students. Most notably this includes instructional materials/resources, which was the most central category in the premap. Finally, in contrast to their counterparts, the number of categories with greater centrality (i.e., scores  $\leq 3$ ) decreased from two categories to one category after the course.

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teachers—that is, neither saw the transmission of mainstream American values as an appropriate teacher role. On the contrary, the participants tended to see their teaching focus as teaching of subject matter and fostering critical thinking in their students. The majority of participants believed in respecting their students as individuals. This was reflected in a number of areas including instructional and evaluation techniques and language use in the classroom. For instance, both groups embraced an individualized view of instruction, asserting that teaching techniques tailored to pupils' unique interests and abilities were most appropriate. Furthermore, although more students in Group A (40%; N = 4) began the course believing more strongly than Group B students (13%; N = 1) that the same standards should be used to evaluate all students, by the end of the course this difference disappeared. That is, at the end of the course, both groups were against the use of universal standards for all students.

Participants' views on language usage

Group B seemed slightly more open to the idea of ability grouping in high schools (Group A mean = 6.0 vs. Group B mean = 6.75). (Higher scores indicate stronger agreement with the use of ability grouping.) Moreover, the participants' views on pupil failure changed after the course. Prior to the course, students in Group A attributed pupil failure primarily to the teacher (i.e., ineffective teaching methods, teacher inattention to uniqueness, and teacher lack of effort). Student background factors were also mentioned by 30% of Group A respondents ( $N = 3$ ). By the end of the course, 33% of Group A students ( $N = 2$ ) reported insufficient student and teacher effort as the most important contributors to pupil failure. Fewer students in Group A (i.e., it changed from 40% to 17%; i.e., from 4 to 1) attributed pupil failure to ineffective teaching methods after the course. The students' home background, perceived as a significant source of student failure in the pre-survey, was no longer seen as an important causal factor.

Students in Group B showed less dramatic changes. Before the course, 43% of these students ( $N = 3$ ) attributed student failure to teachers' inattention to uniqueness, and the same proportion attributed it to the use of ineffective teaching methods. Lack of teacher effort as well as student ability were also reported by 13% of respondents, respectively ( $N = 1$ ). After the course, fewer causal factors were advanced by Group B students. Pupil failure was explained by two factors only: the teacher's inattentiveness to uniqueness and the use of ineffective teaching methods.

Students in both groups began the course with a range of notions concerning the appropriate strategies to use in diverse classrooms. For instance, 60% of Group A students ( $N = 6$ ) believed the most effective approach was to allow all students the opportunity to understand the content. Although the popularity of this approach was somewhat reduced by the end of the course

further illustrated their perspectives on diversity. Groups A and B agreed on what should be the appropriate use of language in the classroom. They did not think that all students should be taught in English if that was not their native language. However, their views on the use of dialects in the classroom were more moderate. Although they agreed that dialects were acceptable in more informal situations (e.g., expressive writing or conversations), they also thought that standard English should be used in more formal activities (e.g., formal speech and writing).

When asked what is the most frequent source of student success, most participants in both groups indicated that student enthusiasm is critical (50%/67% in Group A and 57%/75% in Group B;  $N = 5/4$  and  $N = 4/3$ , respectively). (When figures are presented in fractions, numerators represent presurvey and denominators reflect postsurvey data.) Less often, they believed that the teacher's use of effective instructional strategies was the source of student success. Before the course, four students in Group A (40%) indicated they thought that students' home background could bring about success, but after the course no participant held this view.

In addition, both groups lacked clear perspectives on student ability. When pondering a variety of statements reflecting disparate views on this topic, their responses were mixed and/or unclear. Although most students did not agree that one must have a mathematical mind for math or that certain students will never be good at writing, most participants believed that there are students who are "natural writers." *Differences between groups.* Interestingly, differences between the two groups were observed after they enrolled in the multicultural education class. Students in both groups began the course disagreeing with ability grouping and tracking. By the end of the course, however, students in

teaching culturally diverse students. Furthermore, teachers showed two distinct trajectories of cognitive change at the end of the course. These findings are consistent with the study's constructivist view of teacher learning in which teachers construct knowledge and make sense of experiences based on their frames of reference, prior knowledge, and sociocultural contexts (Aguilar & Pohan, 1996; Powell, 1996; Sutton et al., 1996). Studies on learning to teach have shown that during instruction teachers use a complex amalgam of knowledge in which curricular, instructional, and social context issues are pondered (Grossman, 1992; Reynolds, 1995; Shimahara & Sakai, 1995). The use of concept maps and surveys enabled us to conclude that the patterns of emphasis in these data support this view of teaching. These measures also allowed us to document the effects of the multicultural education course on teachers' knowledge and beliefs—an aspect rarely addressed in previous studies. Specifically, we observed an intriguing interplay between the quantitative and qualitative indicators used to assess teacher cognitive transformations. Let us discuss this finding in more detail.

### Cognitions about Teaching Diverse Learners: Quantitative and Qualitative Indicators

Several indicators of cognitive change were used in the analysis of the concept map data (i.e., density, differentiation, hierarchical organization, reorganization, centrality, and specificity of map items and categories). The relation among these indicators, however, was not always straightforward. Researchers have used the density of concept maps to assess changes in conceptual understanding (i.e., greater density scores have been used as a proxy for more complex conceptual understanding; Morine-Dershimer, 1989). We found that Group A students decreased the density of their concept maps after the course. However, the breadth of more central categories (i.e., the number of cate-

(50%;  $N = 3$ ), and more students in Group A embraced other strategies—such as fostering self-esteem (33%;  $N = 2$ ) and celebrating diversity (17%;  $N = 1$ )—they did not select strategies based on critical theory in either the pre- or the postsurveys. Group B students began the course even more strongly committed to a model that emphasizes opportunity for all students to understand the subject matter (71% of the group;  $N = 5$ ). In fact, only a few Group B students were committed to other models for cultural diversity. After the course, however, this group embraced a wider variety of strategies, representing a wider range of positions about multicultural education. Indeed, their choices were divided to the extent that none was a clear favorite among Group B students.

### Discussion

Our primary goal in this study was to explore the use of measurement strategies to assess the effects of a multicultural education course on preservice teachers' cognition. This is a significant goal because of the scarcity of studies in the multicultural teacher education field (Grant & Tate, 1995). Ladson-Billings (1995) argued that multicultural teacher education is the intermediate step between theory and classroom practice. For this reason, the study's focus on teachers' cognitions (which mediate how teachers understand, use, and apply theory) is of considerable importance.

The study findings suggest that preservice teachers' knowledge and beliefs changed after completion of a multicultural education course. Similarly, the data gathered with concept maps and surveys indicated that teacher educators can learn a great deal about preservice teachers' cognitive transformations in the context of multicultural education courses. However, this study should be replicated before generalizations are made because we worked with a small convenience sample. Participants enrolled in the course with disparate knowledge and beliefs about

to provide a more dense representation of a construct does not necessarily mean that these students engaged in active conceptual reorganization. This is an important finding because it contradicts the traditional interpretation of density changes (i.e., higher density translates into more complex understanding). As we acknowledged above, the meaning of the density construct is not clear in this type of study, particularly if it is examined in isolation from other indicators.

In contrast, the analysis of a set of indicators provided us with the most useful information about participants' cognitive transformations. Indeed, it is the interplay of cognitive change indicators that needs to be examined to assess preservice teachers' conceptual changes. Hence, we concluded that these two groups of teachers exhibited distinct configurations of knowledge change about teaching diverse learners. One group of teachers also seems to have engaged in a more dynamic process of knowledge transformation. Teacher interviews might be an effective means to supplement this information in future studies in order to understand the fluidity and meanings of these changes. Similarly, interviews and observations might in future studies shed light on the meaning of alternative configurations of cognitive change indicators (e.g., the meaning of decreased density and decreased number of superordinate concepts in teachers' conceptualizations).

The qualitative analysis of the data further enriched our understanding of preservice teachers' conceptual changes. The most distinctive feature of all participants' maps was the prominent place that principles of practice had in their conceptualizations. These statements reflect values, perspectives, and principles of practice that teachers hold regarding a multicultural view of teaching and learning. Thus, it is encouraging that the course's pivotal emphasis on the use of the literature on cultural diversity through critical analysis and reflection was incorporated in participants' conceptualizations.

JANUARY 1998

gories with a centrality score  $\leq 3$ ) included in these maps had a negative relation to density changes. Specifically, the breadth of categories included in Group A postmaps increased at the end of the course. At the same time, although Group A students reduced slightly the number of items and the number of levels in their postmaps, they increased the number of superordinate constructs at the end of the course—a pattern consistent with the change in the breadth of categories (see Tables 2 and 3). Thus, it is plausible that Group A students engaged in a fluid integration of their conceptualizations, which may also suggest knowledge accretion (Jones & Vesilind, 1996; Novak & Gowin, 1984).

In contrast, although Group B students increased the density and the number of items in their postmaps, they did not change the degree of hierarchical organization (i.e., number of levels), the breadth of central categories, and the number of superordinate concepts (see Tables 2 and 3). In other words, even though these participants were inclined to give more detail to their conceptualizations, they seem to have engaged in a less active process of conceptual reorganization. In fact, when the total number of changes in superordinate constructs was calculated to assess the nature of map reorganizations, we found that Group B students were less actively engaged in transforming their conceptualizations (see Table 2).

The most important lessons that can be derived from these analyses are twofold. First, concept maps can provide teacher educators and other professionals with useful information about preservice teachers' conceptual transformations about diversity issues. Second, and more important, it could be misleading to use single indicators of cognitive changes as the sole evidence of intervention effects. We would have made an incomplete interpretation of these data had we concluded that the course had a negligible effect on the group that decreased their map density after the course. Indeed, the ability

processes in their concept maps switched emphasis to teacher-centered approaches. (The focus was on pupil-centered approaches before the course.) Hence, Group B participants appeared to give greater value to the potential role of teachers in promoting student learning. It is ironic that the students who presumably were less actively involved in reorganizing their conceptualizations embraced a view of teaching diverse students that challenged traditional approaches in this field. It is not clear, however, whether this pattern reflects the fact that these teachers entered the course with this perspective and thus hardly changed their views.

It should be noted that our analysis of the social context issues should not suggest that we prefer one over the others; it merely helped us to discern how these preservice teachers used their knowledge of multicultural education to conceptualize good teaching. We believe that good teaching for diverse learners should be based on consideration of a combination of curricular and instructional issues along with a critical focus on social context concerns. Similarly, it is obvious that all preservice teachers incorporated these three kinds of concerns in their conceptualizations. The analysis of qualitative emphases helped us to understand what might be prominent in these teachers' minds when they think about effective teaching for diverse pupils.

### Conclusions and Future Research

We identified clear differences in the cognitive profiles of preservice teachers enrolled in a multicultural education course. The evidence obtained from concept maps and surveys suggests that participants were still in the midst of reconfiguring and reconciling certain beliefs and theories. This is consistent with a view of teachers as learners of enthusiasm, poor home background, low ability) (McDiarmid, 1993). Notably, Group B respondents' reference to instructional

zations in the form of teaching principles for diverse students.

Interestingly, Group A students (who purportedly were more actively engaged in conceptual reorganization) seemed to emphasize a "technical" dimension of teaching that related to curriculum considerations (e.g., goals, content, materials). Similarly, although the course emphasized a broader conception of diversity, these students might have adopted a traditional view of multicultural education in which cultural diversity resides *within* the pupil (i.e., student characteristics/background). This emphasis was also reflected in their attributions for pupil failure reported in the survey. Reported, preservice teachers' knowledge of pupils is limited, and they tend to focus on "discrete objects or surface features of events and problems" (Carter, 1990, p. 299). Furthermore, preservice and novice teachers tend to be concerned with pedagogical issues (e.g., management and classroom procedures) (Artiles, 1996; Carter, 1990). Thus, it could be argued that issues that may bring "structure" and/or "certainty" to teachers' work (e.g., instructional goals and materials) were highlighted in Group A's conceptualizations.

In contrast, students in Group B tended to be concerned with social context issues, particularly after the course. Although Group B students included in their conceptualizations instructional and curricular aspects, they tended to downplay the role of these issues. These students' view of teaching was based primarily on social context in the form of teaching principles and other related aspects (e.g., parental involvement). In the same vein, after the course Group B students attributed pupil failure to teacher factors. This is an interesting finding because researchers who used the same survey found that preservice teachers ascribed student school failure to pupil factors (e.g., lack of enthusiasm, poor home background, low ability) (McDiarmid, 1993). Notably, Group B respondents' reference to instructional

should be viewed as a photograph taken at a particular time of these teachers' cognitive kaleidoscopes that constantly reconfigure themselves as teachers develop professionally and personally.

The differences in teacher cognitions identified in this study are important because most studies of preservice/novice teachers' thinking have tended to ignore intragroup differences. These data show that important differences can exist within a group of novice teachers regarding their thinking about cultural diversity. The findings of this study also raise interesting questions about the expected outcomes of multicultural education courses. For instance, should preservice teachers be expected to increase the complexity of their conceptualizations? Is it important that their views also become more fluid in terms of the reorganization of ideas included in their conceptualizations? How are distinct patterns of cognitive fluidity and complexity reflected in teachers' interactive thinking and behavior? What is the effect of distinct cognitive and teaching profiles on student learning? Obviously, the answer to these queries will depend on teacher educators' views about effective teaching for diverse learners. We do not believe that preservice teachers' learning should be assessed merely in terms of the volume of new information acquired. Although we are inclined to think that it is always desirable to observe an increment in the overall complexity of teacher conceptualizations, we would rather look for a balanced representation of well-connected issues pertaining to curriculum, instruction, and social context as they relate to effective teaching for diverse learners.

In future investigations, researchers should bear in mind that *both* quantitative and qualitative indicators of teacher conceptual changes ought to be used in this type of study. Likewise, future studies should include teacher interviews to assess the meanings that informants attach to the map contents. This will enrich the qualitative analysis of teachers' conceptualizations and meanings. Future inquiries will also need to examine not only the differences in teachers' conceptualizations but also the "gray areas" in which we found evidence of ambivalent and contradictory positions about particular notions (e.g., student ability, language use in the classroom) and resistance toward certain theoretical perspectives (e.g., critical theory). Although we could not analyze these variables in this study, other researchers have started to address these variables in the context of multicultural teacher education (Cross, 1993; McDiamid, 1993; Rios, 1993; Solomon & Levine-Rasky, 1995).

We concur with Zeichner (1993) that "much more work needs to be done to look at the process of teacher education for diverse students" (p. 22). This study focused on a short-term effort to change teachers' cognitions. It is not clear if longer or more intense courses will have a long-term effect on preservice teachers' cognitions about diversity. Thus, researchers need to examine the potential effects of length and intensity of this type of intervention. Longitudinal studies will also allow researchers to assess how the connection between teachers' conceptualizations and understandings of effective teaching for diverse students and their teaching styles are transformed during their preservice education and first years of teaching (Artiles, Barreto, Peña, & McClafferty, in press).

## Appendix A Teacher Beliefs Survey

Name: \_\_\_\_\_

Student ID#: \_\_\_\_\_

Date: \_\_\_\_\_

Directions:

This is a questionnaire about your career plans and views of teaching. There are no correct answers



to these questions. We are interested in learning about your beliefs on these aspects, so please take your time and respond to these questions based on your opinions.

*Career Plans*

1. What level of certification will you obtain? (circle all that apply.)
  0. I do not teach/plan to teach.
  1. Preschool
  2. Early elementary (K-3)
  3. Elementary (K-8)
  4. Middle school/junior high school
  5. Secondary English
  6. Secondary mathematics
  7. Administration
  8. Other (please specify): \_\_\_\_\_
2. Which of the following best describes your career plans? In the next five years, I intend to ...
  1. Leave/remain a teacher.
  2. Leave/remain an education specialist (e.g., math, reading, library, media resources, etc.).
  3. Become/remain a school administrator.
  4. Find a job outside the education field.
  5. Leave the work force to care for a family.
  6. Leave the work force for another reason.
3. How certain are you that you will realize your career plans?
  1. Uncertain
  2. Fairly certain
  3. Sure
4. Which grade levels would you prefer to teach?
  0. I would not want to teach any grade level.
  1. Preschool
  2. Lower elementary (K-3)
  3. Upper elementary (4-6)
  4. Middle school/junior high (7 & 8)
  5. High school (9-12)
  6. College
5. Which subject area is/would be your favorite to teach?
  0. I would prefer not to teach any subject.
  1. English/Language arts
  2. Reading
  3. Mathematics
  4. Natural science (biology, chemistry, physics)
  5. Social science (psychology, sociology)
  6. History/Social studies
  7. Fine arts (art, music, drama)
  8. Physical education
6. Which subject area is/would be your least favorite to teach?
  0. I would prefer not to teach any subject.
  1. English/Language arts
  2. Reading
  3. Mathematics
  4. Natural science (biology, chemistry, physics)
  5. Social science (psychology, sociology)
  6. History/Social studies
  7. Fine arts (art, music, drama)
  8. Physical education

0. I would prefer not to teach any subject.
1. English/Language arts
2. Reading
3. Mathematics
4. Natural science (biology, chemistry, physics)
5. Social science (psychology, sociology)

6. History/Social studies
  7. Fine arts (art, music, drama)
  8. Physical education
7. In which of the following settings would you prefer to teach?
0. I would prefer not to teach.
  1. Public school
  2. Private nonsectarian school
  3. Private religious school
8. In which of the following settings would you prefer to work?
1. Small town/rural (population less than 25,000)
  2. Town (population 25,000 to 100,000)
  3. City (Suburban) (population 100,000 to 500,000)
  4. Urban (population more than 500,000)
  5. Overseas

*Views of Teaching and Learning*

For the statements below, indicate your agreement or disagreement by circling the number that best expresses what you think about the statement. Your replies to these statements can range from strongly agree (SA or 1) to strongly disagree (SD or 7).

	1	2	3	4	5	6	7
	Strongly			Not			
	Agree (SA)			Sure			
						Strongly	Disagree (SD)
1. Teachers should avoid grouping students by ability or level of performance.	1	2	3	4	5	6	7
2. A lot of my ideas about teaching and learning come from my own experience as a student.	1	2	3	4	5	6	7
3. Teachers should use the same standards in evaluating the work of all students in the class.	1	2	3	4	5	6	7
4. It is impractical for teachers to tailor instruction to the unique interests and abilities of different students.	1	2	3	4	5	6	7
5. Students learn best if they have to figure things out for themselves instead of being told or shown.	1	2	3	4	5	6	7
6. When working with slow learners, teachers should focus nearly all their instruction on "minimum competency" objectives.	1	2	3	4	5	6	7
7. Required high school courses should separate classes for low-achieving and high-achieving students.	1	2	3	4	5	6	7
8. The main job of the teacher is to transmit the values of the mainstream American culture.	1	2	3	4	5	6	7
9. The main job of the teacher is to encourage students to think and question the world around them.	1	2	3	4	5	6	7
10. The main job of the teacher is to teach subject matter.	1	2	3	4	5	6	7
11. All students should be taught in English.	1	2	3	4	5	6	7
12. There are some students who can simply never be good at writing.	1	2	3	4	5	6	7
13. Some people are naturally able to organize their thoughts for writing.	1	2	3	4	5	6	7
14. To be good at mathematics, you need to have a kind of "mathematical mind."	1	2	3	4	5	6	7

15. When students are successful in achieving intended goals or objectives, that success is often attributed to one of the following sources. Which do you believe is the most frequent source of success? (Choose one.)
1. Student's home background
  2. Student's intellectual ability
  3. Student's enthusiasm or perseverance
  4. Teacher's attention to the unique interests and abilities of students
  5. Teacher's use of effective methods of teaching
  6. Teacher's enthusiasm or perseverance
16. When students fail to achieve intended goals or objectives, that failure is often attributed to one of the following sources. Which do you believe is the most frequent source of failure? (Choose one.)
1. Student's home background
  2. Student's lack of intellectual ability
  3. Student's indifference or lack of perseverance
  4. Teacher's failure to consider the unique interests and abilities of students
  5. Teacher's failure to use effective methods of teaching
  6. Teacher's indifference or lack of perseverance
17. If you were working with low achievers in mathematics, which one of the following would you emphasize most? (Choose one.)
1. Basic computational skills
  2. Nontraditional topics, such as geometry and probability
  3. Problem solving
  4. Helping students understand the theories behind the topics
  5. Making math class fun for students
  6. Other (specify): \_\_\_\_\_
18. If you were working with high achievers in mathematics, which one of the following would you emphasize most? (Choose one.)
1. Basic computational skills
  2. Nontraditional topics, such as geometry and probability
  3. Problem solving
  4. Helping students understand the theories behind the topics
  5. Making math class fun for students
  6. Other (specify): \_\_\_\_\_
19. If you were working with low achievers on learning to write, which one of the following would you emphasize most? (Choose one.)
1. Basic spelling and grammatical skills
  2. Nontraditional types of writing, like sonnets and editorials
  3. Developing and refining an argument in writing
  4. Helping students understand the role of audience and purpose in writing
  5. Having fun through writing things like composing haiku
  6. Other (specify): \_\_\_\_\_
20. If you were working with high achievers on learning to write, which one of the following would you emphasize most? (Choose one.)
1. Basic spelling and grammatical skills
  2. Nontraditional types of writing, like sonnets and editorials
  3. Developing and refining their ideas in writing
  4. Helping students understand the role of audience and purpose in writing
  5. Having fun through composing things like haiku poems
  6. Other (specify): \_\_\_\_\_
21. Many teachers work in classrooms that include students from a variety of ethnic and social backgrounds. Below is a list of things that teachers might try to do in such classrooms. Circle the number beside the *three* things that you would be most likely to do if you were

to teach in such a classroom. Then, rank these three things from 1 to 3 in order of their importance to you. Rank order things teachers might try to do (Circle the three you'd be most likely to do and then write 1, 2, or 3 next to each to indicate which you would be most likely [1], second most likely [2], and third [3] most likely to do.)

1. To make sure that all students have the opportunity to understand the subject matter in ways that increase their capacity to figure things out for themselves.
2. To honor and celebrate diversity by having students from different backgrounds share their foods, customs, language, and values with their classmates.
3. To teach the common core of values that all Americans, regardless of their background, share and on which our political and social institutions are built.
4. To teach students about the discrimination and injustice that various ethnic groups have encountered.
5. To make sure that, above all else, all the students feel good about themselves even if they aren't learning what they should be learning.
6. To teach students that American society offers opportunities to everyone and that anyone who wants to improve his or her economic situation can do so if they work hard enough.

22. In recent years, school celebrations of Christmas have been banned by many school boards around the country to the consternation of some parents. Which of the following is closest to your view of this situation? (Circle the number before the statement that is closest to what you believe.)

1. I think that in public schools there should not be any celebration of any religious holiday.
2. If we celebrate Christmas holidays, we also need to observe and celebrate, in a similar fashion, Jewish, Moslem, Buddhist, etc., holidays.
3. I think too much emphasis is put on holidays in school; we need to put the time and energy that goes into holiday celebration into school work.
4. Our culture is predominantly Christian and our children should learn these values.
5. I think that the argument that children who don't celebrate Christmas will feel excluded is unsound.
6. I think that the majority of parents support such observances and their wishes should be respected.
7. Other (please explain): \_\_\_\_\_

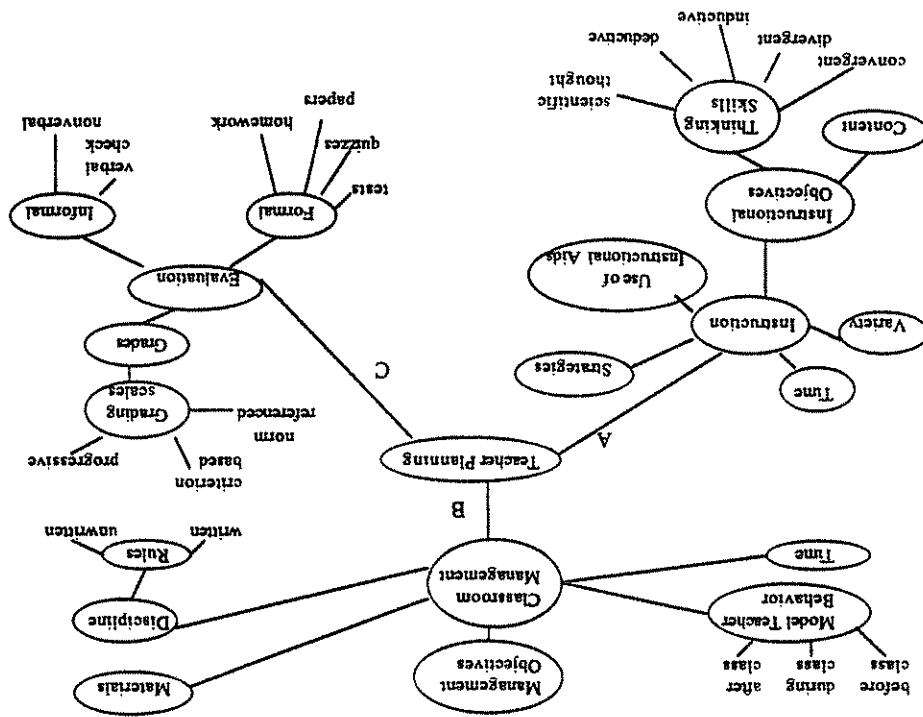
23. As you know, there's a lot of discussion about students' use of various regional dialects in the classroom. Which of the views below is closest to your own? (Circle the number before the statement that is closest to what you believe.)

1. Because the purpose of schooling is to get all students to speak the same language, dialects such as Spanish or black English have no place in the classroom.
2. While students may use various dialects among themselves and in classroom discussions, they need to use standard English whenever they write.
3. Dialects like black English are fully legitimate languages and appropriate for classroom discussion and for expressive writing like poetry, but students must use standard English in writing expository prose and formal speech.
4. Regional dialects (such as black English) are fully legitimate languages and should be accepted in classroom discussions, speeches, and compositions on a par with standard English.

—THANK YOU FOR YOUR ASSISTANCE—

SOURCE.—From McDiarmid, G. W., & Price, J. (1990). *Prospective teachers' views of diverse learners: A study of the participants in the ABCD Project*. Michigan State University, National Center for Research on Teacher Education. Reprinted by permission.

Appendix B  
Sample Concept Map and Calculation of Concept Map Density



CALCULATION OF DENSITY

3 main categories  
2nd level categories/elements  
3rd level categories/elements  
4th level elements

A	1	1	1
B	5	5	3
C	1/2	2/4	3/7
	5	2	3

Area = 12 cells  
Density = 39 items + 12 cells = 3.25

FIG. B1.—From Morine-Dershimer, G. *Journal of Teacher Education*, 40 (4), pp. 46-52. Copyright © 1989 by Corwin Press, Inc. Reprinted by permission of Corwin Press, Inc.

Note

to Greta Morine-Dershimer for using time from her sabbatical to review drafts of this manuscript.

We would like to thank the participant students and the administrators of the teacher education program for allowing us to conduct this study. We are indebted to Valeria Chow, Amanda Munda, and Amanda Hernandez for their significant contributions in the data analysis phase of the study. We are grateful to Stan Trent for his feedback on earlier drafts of this article and particularly

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