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ABSTRACT

This paper discusses the effectiveness of mediated instructional strategies in culturally and linguistically diverse learning environments, focusing on the use of computer-mediated instruction and its relationship to various learning styles. It examines learning style dimensions and reviews related literature on the relationship between computer-mediated instruction and cognitive style dimensions and academic outcomes for students. The paper discusses presentation strategy and academic achievement, presentation strategy and time on task, cognitive style and time on task, cognitive style and academic achievement, teaching in a linguistically diverse culture, instructional strategies and learning styles, learning styles and culture, ethnolinguistic instruction and learning, multicultural education, globalization of institutional curricula, and multicultural teaching strategies and learning styles. It concludes that culturally relevant curricula and instructional techniques should relate experientially and personally to the cognitive, academic, social, and linguistic abilities of students, and that learning traits and window presentation strategies should be considered in text reading, computer-mediated instructional development, instruction, and software design. (Contains 44 references.) (MDM)

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Effectiveness of Mediated Instructional Strategies and Learning Styles in Multiculturally Linguistic Environments: Implications for Developmental Educators

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Abstract

While it is well known that factors other than the instructors' teaching strategies influence learning, not all the sources of influence have been identified in culturally diverse teaching-learning environments. Research efforts have focused on understanding the nature of the cognitive processes as they affect learning. Few studies have investigated learning styles in multicultural settings. Fewer studies have investigated instructional strategies in terms of the diversity of learning in individuals representing various cultural and ethnic groups.

Learning styles are those unique ways an individual gathers and processes information. Cognitive learning styles are the information processing habits that represent a learner's typical mode of thinking, perceiving, problem-solving, and remembering (Greco & McClung, 1979; Grieve & Davis, 1971; Messick, 1976, 1984; Witkin, 1979; Witkin & Goodenough, 1981; Witkin, Moore, Goodenough, & Cox, 1977; Witkin, Oltman, & Karp, 1971). These styles constitute important traits of individual differences among students and appear to have important implications for developmental education instructors as well as in instructional design. These implications are explored in this article. The learning styles are synthesized into a single learning style continuum for possible inclusion in multiple multimedia.

Computer-mediated instruction uses a combination of windows and windowing system. Windows allow the user to interact with multiple sources of information (Lamberski & Dwyer, 1983). Presentation strategies (overlapping, tiling, and mixed displays) are the window presentation styles. They are the spatial relationships between windows and the types of operations that can be performed on them (Eysneck, 1993; Galitz, 1994, p. 148; Livingston, 1991; Rayner, 1992). Windowing is a technique in which only a portion of the displayed screen is used for a particular task (Eysneck, 1993). It is categorized into a single (paging) and a scrolling window. Effects of window presentation strategies and different learning styles are discussed in this article with potential implications for instructional designers.

Effectiveness of Mediated Instructional Strategies and Learning Styles in Multiculturally Linguistic Environments: Implications for Developmental Educators

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I. Introduction

Learning outcomes are significantly influenced by learner's cognitive, cultural, and linguistic characteristics. These learning outcomes have become more obvious in today's developmental education classrooms given the culturally and ethnolinguistic diversity that impact learning and, consequently teaching. Thus, developmental educators should be aware of the unique learning preferences of all students, including individual differences, culturally-bound linguistic variables, and the interrelationships among these factors with the instructors teaching strategies. The ethnolinguistic and cultural differences brought to the classroom by linguistically diverse developmental students should be the axiom upon which developmental education instruction are to be based. The instructional strategies should include necessary and sufficient instructional situations (conditions) in content, emphases, curricula, and classroom activities to foster learning and stimulate recall in any mediated instructional environment.

The early developments of computer-mediated instruction (CMI - e.g., CBI/CAI, CBT, etc.) were based solely on behavioral models which did not consider individual differences in terms of aptitude or cognitive styles (Eysneck, 1993; Messick, 1976, 1984). The move toward the use of cognitive models has resulted in the need to find better cognitive-oriented methods of presenting information (Aspillaga, 1991; Elliot, 1976; Livingston, 1991; Rayner, 1992). A learner's cognition is enhanced more in a self-regulated learner-controlled learning environment than in a self-regulated program-controlled computer-mediated one (Young, 1996). Explaining the cognitive style of filed dependence status (CSFDS), Cross acquiesced:

Individuals see and make sense of the world in different ways.

> They give their attention to different aspects of the environment; tackle problems with different methods; construct relationships in distinctive patterns; process information in different but personally consistent modes; and acquire knowledge based on their knowledge structures. Style has a broad influence on many aspects of personality and behaviors; manifesting itself in perception, memorial tasks, cognition and metamemory, interests, social behaviors, and self-concept (Cross, 1976, pp. 115-116).

Since the role of learning styles and instructional strategies is very crucial in multicultural classrooms, and cannot be undermined, this article examined the role of learning styles that are culture-bound and their implications for developmental educators. It also explored some issues in student-teacher interactions in an attempt to help developmental instructors create learning environments that are both homeostatic and congruent with the different needs of their students and ways of achieving and sustaining consistency in multiculturally-driven classrooms. Within the principles of pedagogical equity proposed by cultural pluralism and, the doctrines of Instructional Systems and Technology, this article offers practical guidelines in the area of mediated instruction in socio-ethno-linguistic diverse developmental education classroom environments.

The organization of the article parallels the findings in the reviewed literatures: a question is posed and axiomatic foundations about teaching-learning processes are established, which in turn, leads to definition of learning styles dimension. Review of related literatures focused on some of the issues and possible solutions to the question. A brief summary and conclusion is provided in section three. Section four is a synthesized discussion of these issues as they relate to multicultural education in a culturally diverse

developmental education classroom environment. The article concludes with some implications for further investigative inquiries in the field of developmental education and instructional design.

Potential Question and Issues

It is important to know how learners with different learning styles could be affected from different presentation strategies on the computer screen. It is equally important to know how different presentation strategies could be used in effective instructional strategies for any computer-mediated instruction or tutorial. The question based on the reviewed studies could be phrased as: "Would teaching for diversity in multiculturally and linguistically diverse developmental education settings help developmental instructors confront their biases and redirect their teaching focus to create an optimum learning environment for all students, contribute to the success of socioculturally and ethnolinguistically diverse student clientele, enhance students' self-concept and self-efficacy, increase students' level of motivation, and improve students' academic achievement thorough improved and conditioned cognitive and metacognitive learning styles?"

Answers to this question are discussed in this article. Some issues relevant to the question and the concepts mentioned in this article are further explored and clarified.

Learning Styles Dimensions

It has been posited that both instructors and students in multicultural education settings converge in a learning environment usually unconscious about how learning should take place (Alexander

& Dochy, 1995); and this inevitably leads to frustration on both parties (Birenbaum & Kraemer, 1992). Several assumptions that underlie the decision of teaching strategies and learning styles in multicultural environments can be useful. However, the assumptions made about the dynamics of learning reflect a process of "cultural programming," whose understanding would help both developmental instructors and students to be more conscious about the student-teacher relations and teaching-learning processes (Johnson & Johnson, 1996). Knowing these assumptions would also enhance learning and teaching in an environment conducive to linguistic, cultural, cognitive, and social demands of the teaching-learning situation. Before I define learning style and address the relevant issues in teaching-learning situations, it is important to offer the following underlying assumptions.

Underlying Assumptions

1. Different learning styles -- cognitive field dependence status and abstract-concrete -- do exist and can be combined to form a single learning styles dimension
2. Differences in learning styles also exist within a particular ethnic or cultural group. That is, learning styles transcends all cultures and ethnic groups.
3. Understanding the cultural differences of students would help overcome diagnostic and assessment difficulties often encountered in student placement in appropriate learning environments.
4. Developmental students should have the opportunity to learn through their own preferred ways.
5. Instructional strategies and student learning styles can be identified, and appropriate measures taken to combat differential knowledge gains through appropriate classroom management.
6. Developmental educators are most helpful when they assist students in learning through their own learning preference by providing timely feedbacks and autonomy.
7. Instructional strategies can be mixed for optimal knowledge

gains.

8. Developmental educators can develop instructional strategies and materials that are responsive to students' learning potentials and preferences by juxtaposing and sequencing instruction, providing motivation, stimulating recall, nurturing flexibility, and incorporating multiple media as part of their teaching strategy.
9. Students have the ability to shift their learning styles as instruction progresses even with increased rigors in the instructional delivery.
10. A student-oriented self-regulated mediated instructional program is preferred to a program-control self-regulated one.

Learning Styles: A Working Definition

`Cognitive styles' is a concept that deals with thought patterns and their relationship to the environmental factors. Field dependence status is the "perceptual differential" where the organization of the prevailing field determines the person's perception. The term `learning styles' assumes that learners (in stages of learning) are in constant flux with their environments (Kolb, 1976, 1984). According to Messick (1976), learning styles is a generic term that includes three distinct sub-styles: cognitive, affective, and physiological. Inherent within this trichotomy are several aspects of learning as they relate to the learner's sociocultural, ethnolinguistic, and physiological environments. Kolb's (1984) model divides the learning process in four learning styles stages: `Accommodator' - learning from example, doing, or acting; `Assimilator' - learning by logical thinking; `Converger' - learning by watching and listening (i.e., theory-based learning); and `Diverger' - learning by analyzing.

Operationally, `learning styles' are the preferred ways developmental learners adapt in learning new information and

skills; a patter of information absorbing, processing, and regurgitating of anchored information stored in the student's reservoir of learned materials (Ikegulu, 1995). Learning styles is an array of sociocultural, linguistic, experiential, and educational factors that influence the way diverse students learn (Garcia, 1991; Henderson & Landesman, 1995; Messick, 1976).

Cognitive styles of field dependence status (CSFDS, field-dependent and field-independent) are conceptualized as stable attitudes, preferences, or habitual strategies which determine an individual's typical modes of perceiving, remembering, thinking, and problem-solving (Messick, 1976, p. 26). Field-independent learners tend to articulate figures as discrete from their backgrounds and can more easily differentiate objects from the embedding context. Field-dependent learners, on the other hand, tend to experience events within the content of the whole. Field-neutral individuals are mid-way between these two learning modes (Elliot, 1976; Eysneck, 1993; Livingston, 1991; Young, 1996).

II. Review of Related Literature

The present article reviewed relevant literatures on the relationship between, and the effectiveness of, computer-mediated instruction and cognitive styles dimensions on students' academic outcomes. The Educational Resource Information Center (ERIC), the Educational Abstracts, and "PsychLit" were the databases used to build the bibliography. I was able to locate about 30 ERIC journals (EJ) and 13 ERIC documents (ED) from 1989 to 1996. Of the 43 ERIC journals and documents, only 12 were directly related to the purpose of this article. The bibliography of secured papers and

reports served as other sources of reference.

This article focused on the following tentative research issues as a guide in organizing the reviewed literatures: (1) Presentation strategies on students' academic achievement. (2) Teaching in a linguistically diverse culture. (3) Multicultural education: Teaching and learning for diversity.

Presentation Strategy and Academic Achievement

Eysneck (1993), Livingston (1991), and Rayner (1992) indicated that windowing techniques encouraged learners to focus on the content; that each window provides a different function, perspective, and application; and that learners with different cognitive styles view information differently. They further indicated that presentation strategies should include a variety of visual options such as graphic displays and videos.

Benshoof and Hooper (1993) investigated the effects of single- and multi-window presentation strategies on academic achievement for different ability students. These students were classified as high or low ability according to their task performance. They found that there were no differences in the type of windows used; that the high ability students in the single window group demonstrated higher post-test means scores on verbal information and rule use items than other students; that there were significant differences between the high-ability single-window group and all other groups; and that there were significant differences between the high-ability multi-window group and low-ability single-window group. In this study, strategies in short- and long-term memories were found to be ineffective for multiple window presentations.

Presentation Strategy and Time on Task

Scrolling is not appropriate for novice users because the inexperienced user may not know how to manipulate -- reducing screens, moving screens, opening and closing screens -- the window environment (Rayner, 1992). Paging (a single window) is often preferred by novice users and it resulted in better performance on the sorting task (Livingston, 1991). Research showed that in windowing, novice users in a single window environment performed their tasks faster than in a scrolling environment; and that unpracticed users performed three different tasks (word reading, sorting tasks, and line searching) with both paging and scrolling window techniques (Eysneck, 1993; Livingston, 1991; Rayner, 1992).

Supplemental to window presentation strategy, Young (1996) and Rayner (1992) indicated that window location plays an important part in the teaching-learning process. An information placed on windows facilitates transfer of learning when compared with information placed in random locations. Moreover, spatial location becomes an organizer that aides learning by providing encoding links or anchors to existing information.

Cognitive Style and Time on Task

Cognitive style of field dependence is marked by a propensity for making intuitive responses that are affected by contextual factors without determining the relevance of these factors (Messick, 1976). In investigating the completion time in an instructional gaming environment, Livingston (1991) observed that the time required to complete each block of games was inversely related to time on task. This inverse relationship was attributed to practice. In addition, she found that performance on a computer task varied according to the complexity of the color presentation

used. Livingston's (1991) conclusion was not supported by Dwyer et. al. (1983, 1991, 1992) studies. The Dwyer related studies were not computer related. A contrasting effect was also discovered in Young's (1996) study.

Young's (1996) study determined whether the type of instructional control and learner level of self-regulated learning strategies (SRLS, high and low) interacted to predict different learning outcomes. He tested 26 (13 males and 13 females) seventh graders. These pupils were subjected to two treatment groups, SRLS with learner controlled (LC) and SRLS with program-controlled (PC). In a 2 X 2 factorial design, the LC/High SRLS group spent less time on the CBI lessons than the PC/High SRLS group. Furthermore, the time on task for the interaction effect between the PC/Low and High SRLS group and the LC/Low and High SRLS groups was not significant.

Cognitive Styles and Academic Achievement

Field-dependent/independent (FD/FI) is construct in educational psychology that is related to a "global versus analytical" way of perceiving information. Dwyer and Moore (1991, 1994) and Lamberski and Dwyer (1983) contended that color coding was directly related to academic achievement. Young (1996), on he other hand believed that mediated instruction should incorporate more learner-controlled features in their CMI and tutorial environments. Young indicated that students classified as low and high ability performed differently in self-regulated learning strategies (SRLS) if they have autonomy of the learning environment. His hypothesis predicted a significant main effect for SRLS and that learner-control was more protective than program-control in CMI and tutorial learning environments.

Livingston (1991) and Rayner (1992) showed that learners with different cognitive styles viewed information differently. Dwyer & Moore (1991, 1992/94) found significant differences in performance between FD and FI learners on the drawing test. Field-dependent individuals, when presented with a visualized presentation, tend to modify the structure but accept and interact with it as presented (Lamberski & Dwyer, 1983). Field-independent individuals tend to act upon a visual stimulus, analyzing it with their own structures (Dwyer & Moore, 1991, 1992/94; Lamberski & Dwyer, 1983). In the Dwyer-Moore-Lamberski studies, students were classified into three cognitive learning styles as either field-dependent, field-neutral, or field-independent based on their mean score on the group-embedded figure test (GEFT).

Spiro and Tirre (1980) showed that knowledge-based processing was more "stimulus bound" when learners were more "text bound" in analogous tasks; and that schema utilization was positively correlated with high rate of recall. The hypothesis tested in this study was that one source of style difference in skilled discourse processing would be related to biases in the extent to which one used knowledge schemata (Spiro & Tirre, 1980, p. 204). They found that greater reliance on schemata-based processes was evinced by those who, in other situations, demonstrated abilities analogous to those required by applying schemata to text. They concluded that the treatment (restaurant) group had greater mean rate of recall, retained more information, and possessed more schemata reliance than the control (grocery) group. Furthermore, their study was favorable to the high GEFT students. Students classified as high cognitive (FI) learners had higher learning abilities than those

classified as low cognitive (FD) learners.

Teaching in a Linguistically Diverse Culture

The understanding of the variables affecting teaching and learning is essential for developmental instructors and students. Effective schooling is akin to the unique linguistic, cognitive, and social characteristics of the learners especially those who represent an array of cultural and linguistic groups. Learners' characteristics are the general framework within which they socialize and interact; and the development of learners' preferred ways of learning is directly related to their culture (Alexander & Dochy, 1995; Birenbaum & Kraemer, 1992; Kwok & Lytton, 1996; McGregor, 1993).

The bulk of research studies have investigated the relationship between learning styles in terms of the relevant sociocultural experiences of learners and their interaction with the environment around them (Kolb, 1984; Johnson & Johnson, 1996). These experiences are evident in the salient features of behavior as they relate to one's culture, language, religion, and folkways (Alexander & Dochy, 1995; Kwok & Lytton, 1996).

Instructional Strategies and Learning Styles

In a school setting, learning styles and traits indicate how students are engaged to substantiate knowledge and solve problems. Learning styles are carved in the deep structure of neural organization and personality that molded human development and the cultural experiences of the home, school, and community (Birenbaum & Kraemer, 1992; Johnson & Johnson, 1996).

Birenbaum and Kraemer's (1992) Israeli study was designed to investigate the perception of gender-specific and ethnicity effects

on students' motivation, academic performance, and factors contributing to their success in content-domain areas in mathematics, English, Hebrew, and Arabic among Jewish (58 males and 81 females) and Arabic (99 males and 84 females) ninth-graders. Gender was found to be more culture-bound. Language was more ethnic-bound. Content and gender were more protective for males in mathematics than for females. Arabian males perceived all contents as masculine and preferred affect to worth. Arabian females perceived English more interesting and feminine, easy, and enjoyable. Arabic and Hebrew languages were preferred by both gender of both ethnic groups. Both males and females (within ethnicity) placed more emphases on worth and memorial (cognitive skills) to success in mathematics and English. The authors concluded that instructional strategies aimed at achieving congruence and homeostasis with respect to gender, ethnicity, and learning styles would be more evinced and preferred to the one solely dependent on curricula specifications.

Learning Styles and Culture

Culture is a way of life that encompasses a set of both genetic and acquired (learned) attitudinal factors that determine the behavior of learners (Alexander & Dochy, 1995; Henderson & Landesman, 1995; Kolb, 1984; McGregor, 1993; O'Brien, 1994); and impacts learning (Birenbaum & Kraemer, 1992; Garcia, 1991; Johnson & Johnson, 1996; Kwok & Lytton, 1996).

A quasi-experimental design study conducted by Johnson and Johnson (1996) aimed at examining the relationship between levels of abstract-concrete thinking and multiethnic beliefs in inservice teachers, and the implications for instructional design training

programs for a sample of 123 middle school teachers. Results of the ANOVA statistical procedure indicated that: (1) inservice teachers classified as concrete thinkers had significantly stronger beliefs in `cultural encapsulation' and `majority dominance' than those classified as middle-level and abstract. (2) Abstract thinking inservice teachers had significantly weaker beliefs in `cultural hostility' than the middle-level and concrete thinkers. (3) Middle-level thinkers had significantly stronger beliefs in `minority suppression' than the abstract and concrete thinkers. It was also found that there were not significant interaction effects among these sub-classes of thinking styles.

A 2-by-3 factorial (randomized block design) study conducted by Hsu and Wedman (1994) examined selected instructional strategies that might influence analogical problem-solving methodologic emphases on content, practice, and cognitive learning styles of field dependence status (FD/FI) for a sample of 252 (74 males and 178 females) undergraduates. Four sets of hypotheses were derived to test the significant main and interaction effects of gender, teaching method, and the six treatment combinations. Field-independent students had a significantly higher mean scores on both the pre- and post-tests than the field-dependent students on all treatment combinations. A three-way significant interaction effect was found from the logistic regression model for the field-independent students who were provided with the principle-based content emphasis with two practice opportunities. Hsu and Wedman concluded that a principle-based teaching method was protective, enhanced students' cognition, and improved students' academic performance; and should be preferred by both educators and

instructional designers alike over the practice-based instructional strategy. In addition, the field-independent learning style was positively related to academic gains than field-dependent learning style especially when the students had more practice problems.

Ethnolinguistic Instruction and Learning

Language literacy shapes learning in the same way that learning is shaped by traditions and folkways. By virtue of linguistic pluralism, Language plays a significant role in shaping and molding learning processes. There are several spoken dialects within a particular language. Within a particular language minority group, languages are cast within the same mold of similarities at the deeper level. There are linguistic variations within the in-group to the surface aspects that ranges from phonological and morphological to syntactic and semantic forms (Alexander, Kulikowich, & Jetton, 1995; Birenbaum & Kraemer, 1992; Karabenick, 1996). Language and communication barriers deter learning, cause frustration, and diminished motivation for at-risk students.

The four experiments by Karabenick (1996) examined social influences (judgement, confusion, intelligence, persistence, motivation, and nervousness) on metacognition to test whether learners' knowledge awareness and co-learners questioning and monitoring have either inhibitive or prohibitive effects in a group dynamic environment. Eighty-eight (41 males and 47 females) undergraduate psychology majors were randomly assigned to eight treatment combinations (4 [frequency of co-learner]-by-2 [order of message presentation]). The analysis of variance (ANOVA) results portrayed that the frequency of co-learners' questions affected the order of message presentation of the learner. Students were more

confused when they could not decode their co-learners' questions, were more emotionally involved when the questions were partially understood, became more motivated when their initial response was affirmative, and less judgmental when they comprehend their co-learners' messages. The dynamics of this study judged students' awareness of the effects of social issues in classroom environments.

Since students come to the learning environment with diverse sociocultural and ethnolinguistic backgrounds, developmental education practices should take into consideration these aspects of students' background characteristics as they influence learning and teaching. To engage all students in a more meaningful educational and intellectual discourse, equitable developmental education practices should value these differences. Unfortunately, linguistically and culturally diverse students' unique learning styles and traits have not been adequately addressed in the developmental education solution in American public schools; thus, providing a partial explanation of the failure of these students (Garcia, 1991; Roswal, Croce, Evans, et. al, 1995).

The dissemination of how knowledge, information, and insights about learning styles and teaching strategies would create a practical approach that is sensitive to the different learning styles and knowledge transfers in today's multicultural learning environments (Henderson & Landesman, 1995; Mevarech & Susak, 1993). These information should be the basis for action and change -- teaching for different learning styles. When developmental educators understand the different ways students absorb and process information, they will be able to adjust their teaching methods to

conform with the expectations of these diverse student clientele. This in turn will foster information recall from the students' reservoir (Alexander & Dochy, 1995; Ikegulu, 1995). Recognizing the various issues on learning styles dimensions, diagnosis and assessment, surveys and instruments, and management, may help extend the linguistically diverse classrooms from curricula-driven and instructor-controlled to media-driven and student-centered teaching-learning environments (Garcia, 1991; Ivey, 1996; Johnson & Johnson, 1996; Karabenick, 1996; O'Brien, 1994). This calls for multicultural education and multiple multimedia teaching methods.

Multicultural Education: Teaching and Learning for Diversity

Developmental and multicultural education are comprehensive approaches that are aimed at providing learning opportunities for all interested learners, embrace and celebrate cultural pluralism, and forge cultural and linguistic pluralism represented in various diverse postsecondary institutions (Garcia, 1991; Karabenick, 1996). The first step toward harmonizing an institutional multicultural curricula through teaching activities is building additive multiculturalism in instructors (Alexander & Dochy, 1995; Alexander, Kulikowich, & Jetton, 1995; Kwok & Lytton, 1996); and creating cultural awareness in students (Cross, 1976; Mavarech & Susak, 1993). One way of realizing this aim is through globalizing the institutional curricula.

Globalization of Institutional Curricula

Multicultural education permeates the curricula and teaching methods, including the socialization and interactional processes among participants (Birenbaum & Kraemer, 1992; Roswal, Croce, et al., 1995); multicultural education methodology that reflects a

clear understanding of cultural pluralism and ethnocentrism (Garcia, 1991); and the integration of multicultural education into not only a specific unit of course, but in all content areas (Alexander & Dochy, 1995; Hsu & Wedman, 1994). The implementation of these primarily rests on curricula, instructors, and the culture of the postsecondary institution (Alexander & Dochy, 1995; Kwok & Lytton, 1996; Mavarech & Susak, 1993).

In a cross-cultural study of conceptual beliefs across varying cultural and educational communities among 120 adults (54 United States and 66 Europeans), Alexander and Dochy's (1995) found three basic expertise that represented a global cultural and educational beliefs of adults: (1) adults who are seeking postsecondary education, (2) adults seeking graduate degrees or holding terminal degrees, and (3) adults who considered themselves experts in their chosen fields (knowledge of beliefs) of endeavor. Understandings about knowledge and beliefs are critical to human growth and development. Definition of terms seemed to have a non-global consensus in global cultures (Alexander & Dochy, 1995); and the implications of these non-universality of terms is a problem in our education systems (Kwok & Lytton, 1996).

Identical results were obtained in Kwok and Lytton's (1996) Canadian (125, 63 males and 62 females) and Hong Kong Chinese (128, 66 males and 62 females) fourth graders and, Galloway, Leo, Rogers, and Armstrong's (1996) 1508 secondary school students enrolled in English and mathematics studies. These studies focused on the perceptions of mathematics ability and actual mathematics performance and the prevalence of maladaptive motivational styles in English and mathematics curricula respectively.

Multicultural Teaching Strategies and Learning Styles

Research has linked cognitive styles of field dependence status to instructional design developments and implementation. Studies conducted in educational spheres suggested that cognitive styles of field dependence status has greater potential for educators and educational problems; and that there are some research indications that this approach may have some pragmatic implications to a variety of educational dilemmas (Grieve & Davis, 1971; Cross, 1976; Greco & McLung, 1979; Sheriff & Williams, 1980; Gagne, 1982; Eysneck, 1993; Galitz, 1989, 1994; Ivey, 1996).

In a study conducted to investigate the effects of cognitive styles of field dependence status on instructional design, Grieve and Davis (1971) provided their participants (global [FD] and analytical [FI] learners) with two sets of instructional delivery methods that would either inductively or deductively aid the learners in comprehending their instructional materials. A significant interaction was found between CSFDS and instructional delivery method. The deductive methodology was more effective with FI learners.

Greco and McClung (1979) investigated the effect of attention-directing learning technique for students classified as field-dependent and field-independent learners. The hypothesis considered in that study was that attention-directing would be protective for the FD than for the FI learners. Two identical versions of a slide-tape lesson were with these treatments. The treatment for this study was audio manipulation -- "supplementary sound" and "attention-directing" audio narrations -- that were administered to global (FD) and analytical (FI) sixth graders. Results indicated

that the FI learners performed better than the FD learners regardless of the treatment used. This contradicted their original hypothesis. Thus, the attention-directing technique was found more protective for the analytical than the global learners. Sheriff and Williams (1980) conducted a meta-analysis to determine the implications of the cognitive styles of field dependence status on instructional development and design. The results of their analysis indicated that the CSFDS -- learning match could result in significantly greater learning concept.

For a developmental educator to develop instructional strategies that are responsive to the wide variety of students and achieve an equilibrium in the teaching-learning process, the instructor must be aware of the unique learning styles of his or her students. For example, one of the most fundamental dimensions of multicultural education is the knowledge construction process which relates to the extent to which instructors help students to understand, investigate, and determine how the implicit cultural assumptions, frames of references, perspectives, and biases within a curriculum or discipline influence the ways knowledge is constructed within the learner (Alexander & Dochy, 1995; Alexander, Kulikowich, & Jetton, 1995; Hsu & Wedman, 1994; O'Brien, 1994). This knowledge would help developmental educators to design curricula and instructions to match the learning styles of the students. Also, instructors should promote different learning styles in their students to enhance their learning. In short, the developmental educator's input in the classroom plays a central role in the final outcome of the students' learning experience. This input-output balance can be achieved when the experiences of

developmental educators and students match (Mavarech & Susak, 1993; Roswal, Croce, et al., 1995).

The 2 X 2 (cooperative versus mastery) study by Mavarech and Susak (1993) posited that students who were trained to generate questions with the cooperative learning method would out-perform those students who were trained with the mastery learning method. That is, a cognitively-oriented multiple approach to teaching should improve students' academic performance and cognitive abilities. The authors examined the impacts of these methods of instruction and its components among 271 Israeli third- and fourth-grade students' questioning behaviors, creativity, and achievement. Results concluded that both the cooperative/mastery and mastery learning students scored significantly higher in course criterion test than the cooperative learning group, who, in turn, had significant mean scores than the control group. The implicative effect of this study is that a rich domain-specific and learner-centered content and curricula are preferred by instructors and students over the program-control one.

In a study of the effects of collaborative peer tutoring program on the self-concept and school-based attitudes of junior high school students, Roswal, Croce, Evans, Horvat, Block, et al. (1995) grouped 282 students into three treatment regimens: peer-tutoring program (PTP), traditional instruction with group dynamic (TGD), and traditional individualized instruction (TII). The PTP group demonstrated significant learning improvements in dropout scores compared with students in both TII and TGI groups. That is, a collaborative peer tutoring teaching strategy can improve students' academic outcomes, improve their level of motivation and

self-concept, and enhance their cognitive and metacognitive awareness.

Some advocates of instructor/student curricula-instructional match suggest that successful instructors adapt their teaching methods to students' learning styles in terms of "eclectic enlightenment" whereby, the instructor changes his or her teaching styles to meet the learning demands of all students (Cross, 1976; Gagne, 1982; Galloway, Leo, et al., 1996; Henderson & Landesman, 1995; Kwok & Lytton, 1996; Roswal, Croce, et al., 1995). That is, instructors tend to select teaching strategies that are compatible with effective learning. This requires instructors to select and mix a variety of teaching styles to make students aware of different strategies to learn (Ivey, 1996; Galloway, Leo, et al., 1996; Kwok & Lytton, 1996; Roswal, Croce, et al., 1995).

Henderson and Landesman (1995) conducted a case-control study to examine, among other factors, the effects of thematically integrated mathematical instruction on "at-risk" students' academic achievement, attitudes, and motivation. The instructional episodes relied mostly on small, collaborative learning groups. It was hypothesized that: "the experimental (thematic instruction) and control (non-thematic instruction) students would differ significantly in their knowledge gains in mathematical concepts; but had insignificant attitudes and motivation" (p. 290). The study supported the conjectured hypothesis. That is, experimental group out-performed the control group in conceptual aspects of mathematics, had similar attitudes and level of motivation.

III. Summary and Conclusion

A developmental education program reform within a multicultural framework as espoused by multiculturalism and linguistic pluralism requires productive changes in the curricula, teaching methods, and social structure of the classroom environment (Cross, 1976). Sound multicultural pedagogy and andragogy should be based on "culturally adequate" teaching strategies and curricula that account for such conditions as `empathy,' `sensitivity,' `relevance,' and `effectiveness' (Birenbaum & Kraemer, 1994; Cross, 1976; Ivey, 1996). First, through the use of culturally sensitive classroom lectures, materials, and teaching techniques, students' academic achievements in all content areas will improve (Kwok & Lytton, 1996). Once developmental educators have effectively demonstrated an earnest understanding of the teaching-learning environment, the level of students' motivation and morale will increase (Galloway, Leo, et al., 1996; Henderson & Landesman, 1995; Hsu & Wedman, 1994; Roswal, Croce, et al., 1995). Second, to assume their responsibility as empathetic instructors in multiculturally and linguistically diverse classroom environments, developmental educators should decenter themselves by becoming ethnocentric, and thus, depolarize inter-ethnic hostility and conflict in the classroom (Birenbaum & Kraemer, 1994; Cross, 1976; Gagne, 1982; Mevarech & Susak, 1993; Ivey, 1996).

Most importantly, "to teach them all means to know them all and sameness in teaching for all guarantees educational inequity for many" (Garcia, 1991). Culturally relevant curricula and instructional techniques should relate experientially and personally to the cognitive, academic, social, and linguistic abilities of students (Alexander & Dochy, 1995; Cross, 1976;

Garcia, 1991). Since these factors vary from one student and culture to another, developmental educators are encouraged to diversify their instructional strategies and teaching aids to address different areas of learning (Cross, 1976; Eysneck, 1992; Rayner, 1992). Students should see themselves as valued members of the group, the "MULTICULTURAL SOUP". This does not connote the "melting pot" theory. Textbooks, literatures, and materials must be free from any bias and misinformation, nor should they perpetuate prejudicial and negative stereotypical images about the groups they represent (Garcia, 1991; Henderson & Landesman, 1995). In addition, the affective implementation of multicultural instruction must be approached as a long-term process that will not produce drastic and dramatic overnight changes in the academic and curricula structure. Finally, providing the "best" education for all requires us to utilize multicultural resources and increase the involvement of parents to establish a dynamic equilibrium from home to school (Galloway, Leo, et al., 1996; Karabenick, 1996; Kwok & Lytton, 1996).

Knowledge acquisition and transfer have both developmental and curricula implications for both globally and analytically oriented individuals. The cognitive learning styles -- field dependence status and abstract-concrete continuum -- which constitute important aspects of individualization among students with regards to the way they acquire, process, and interpret information, seems to have potential impacts on students' cognitive and metacognitive abilities, attitudes, motivation, and awareness (Henderson & Landesman, 1995; Ivey; 1996). Despite the growing interest in educational arenas to address individual differences in conveyors

of instructional materials, little has been done to incorporate cognitive and motivational factors into the curricula and instructional design (Eysneck, 1993; Galloway, Leo, et al., 1996). Motivational style (curricula and instructional contexts) is likely to be more a product of situational (subject-matter content) than individual (age, gender, ethnicity, or non-cognitive) factors (Galloway, Leo, et al., 1996; Garcia, 1991; Gould & Grischkowski, 1983; Ikegulu, 1995; Ivey, 1996; Karabenick, 1996; Young, 1996).

In summary, the multicultural pedagogical implications and classroom activities should be based on information about instructional strategies and learning styles. To bridge the gap between theory and practice, several applications, the most important of which "culture sensitive pedagogy/andragogy -- ethnocentrism and pluralism," of instructional strategies, classroom management, and learning styles research would help in planning an instructional sequence or lesson in a linguistically diverse multicultural classroom environment. Such culturally and linguistically congruent and homeostatic teaching and learning techniques provide developmental students with conditions for effective learning and language development as students are motivated in positive affective learning environments.

IV. Discussion

The results of the reviewed literatures indicated that learning traits and window presentation strategies should be considered in text reading, computer-mediated instructional development, instruction, and software design. Students with different cognitive styles need to be involved successfully with

effective color coded texts, CBI environments, and perceptual movements to achieve high scores in their course criterion tests. These results indicated that window-type in computer screen design, sociocultural and ethnolinguistic, cognitive learning traits, and reading abilities are important considerations.

Computer-Mediated Instruction and Cognitive Learning Styles

Computers have different applications in education. They can be used to assist daily school administration, to provide training environments, or to deliver programmed instructions. In using computers to deliver instructional programs to students, the support of full color and motion as well as screen video display playback on the computers are desirable as video images are realistic and lifelike (Gagne, 1982; Galitz, 1994; Lamberski & Dwyer, 1983). It has been shown that color coding improves students' information retention and knowledge transfer, increases students' attention span, and enhances students' cognition than non-color coding in computer-mediated instruction and tutorials (Dwyer & Moore, 1991; Lamberski & Dwyer, 1983; Elliot, 1876; Livingston, 1991; Young, 1996).

Some researchers have questioned whether aptitudes such as cognitive styles exists as stable traits (Dwyer & Moore, 1991; Lamberski & Dwyer, 1983; Livingston, 1991; Young, 1996); and whether they are different from general intelligence (Messick, 1976; Spiro & Tirre, 1980; Witkin, 1979). More specifically, they have argued that cognitive styles measures such as GEFT are best interpreted as ability tests (Messick, 1976). When considered an ability, field dependence loses its bi-polar, value-neutral aspects (Livingston, 1991).

Interpretation of field dependence status as an ability would suggest that mediated instruction for CAI, CBI, or hypermedia database should focus on assisting field-dependent learners to improve their performance on analytic tasks. This instruction might focus on the development of search strategies similar to library index cards. On the other hand, interpretation of field dependence status as a style would suggest an emphasis towards accommodating individual learning differences. This focus allows for a broader view of the implications of computer-mediated instruction and tutorials, a view that extends beyond the classroom, the multicultural view.

Cross (1976), Gagne (1982), Henderson and Landesman (1995), and Ivey (1996) stressed the importance of incorporating cognitive and affective factors into the curricula and instructions. Cross and Gagne emphasized the integration of internal (cognitive) and external (affective) domain components into the instruction. Henderson & Landesman and Ivey maintained that the key to effective instruction lies in understanding the scope of students' learning styles and, to develop and design instructions and materials that would respond to individual learner's needs. These emphases are "in-situ" both content and context dependent, curricula-driven, and instruction-based. They are also in support of programmed instructions that are student-centered, student-empowered, and media-driven.

The problem is in both content- and context-dependent instructional delivery techniques. Instructions that are discordant and concordant to students' learning styles can be facilitating or debilitating depending upon the students' information processing

capabilities and background (Eysneck, 1993; Ivey, 1996; Mavarech & Susak, 1993; Rayner, 1992; Spiro & Tirre, 1980). Solutions to these problems have been offered (e.g., Galitz, 1989, 1994; Elliot, 1976; Gagne, 1992; Messick, 1976, 1984).

Experimental approaches that accommodate cognitive domains have focused on multiple treatments (Alexander & Dochy, 1995; Alexander, Kulikowich, & Jetton, 1995; Dwyer, et al., 1991, 1992/94; Livingston, 1996; Gagne, 1982; Karabenick, 1996). Matching instruction to individual learner differences has proven to be a very difficult task. No matter how the instructional mixture is attained, one learner is always differentially treated better (or worse) than the other (Elliot, 1976). Research has shown that the assessment of the task performance is a fruitless process (Eysneck, 1993; Gagne, 1982; Rayner, 1992). A consequence of this is the "regression to the mean." This match or mismatch is a problem that has never been resolved. An ideal situation, however, would be to develop and design instructional units or modules that are cost effective and free of bias to all learners. A possible extension would be a multiple multimedia with multilingual capabilities.

Instructional Design and Cogno-Abstract-Concrete Continuum

This section discusses the cogno-abstract-concrete continuum. This is a developmental education concept that is heuristically derived without empirical support. It is, however, the intention of the author to conduct an empirical study to justify and support these constructs in the near future.

Instructional designers should be cognizant and adhere to the research findings with regards to the implications of learning styles dimensions. A computer-mediated instruction with

multilingual capabilities and adequate screen design features could offer more flexibility to developmental education learners and instructors in a linguistically diverse classroom. The cogno-abstract-concrete continuum includes the field-dependent (field dependent-divergent conceptualizers [FDDC] and field dependent-convergent analyzers [FDCA]); the field-neutral (field neutral-receptive equalizers [FNRE]); and the field-independent (filed independent-concrete articulators [FICA] and field independent-divergent discriminators [FIDD]).

Field Dependent-Divergent Conceptualizers

These are learners with the capacity to conceptualize events within their environments. They are the creative individuals with limited interests who view situations from one perspective and then try to duplicate them. They are more people oriented, tend to be alert to social cues, and generally tend to have more developed interpersonal skills. They prefer group dynamics and demonstrate a preference for academic subject (e.g., physical education, theater, literature, arts, etc) that are non-analytical; and occupations geared toward assisting others. These persons also appear to be more influenced by others, exhibit more non-verbal behaviors, and are extremely sensitive to social order and criticism. They are likely to be the weaker developmental learners.

Field Dependent-Convergent Analyzers

These are learners who prefer the analyses of the world around them. A filed dependent-divergent analyst is an action-oriented individual whose focus is on doing things the way they are perceived. They enjoy application of theory to problems. The filed dependent-divergent analyst students are more likely to be stronger

developmental learners, prefer subjects like psychology, sociology, counseling, sports administration, etc; and occupations like office managers, secretary, and clerical duties.

Field Neutral-Receptive Equalizers

These are the mediocre students whose interests are on the conceptualization and articulation of facts and events within their environment. While the FD and FI students are the two extremes on the cogno-abstract-concrete spectrum, the field neutral-receptive equalizers are more adaptable to any situation. They prefer somewhat less structured instructional sequencing and demonstrate a preference for academic subject (e.g., economics, accounting, biology, etc) that are less analytical; and occupations (medicine, pharmacology, education, etc.) geared toward helping people in a less structured environment. They prefer moderation in their daily activities with less protocols and routine works.

Field Independent-Convergent Articulators

These are problem-solvers whose main interest and focus are on logical and orderly arrangement of events around them. They rely on algorithms; and can disassemble a machine into its component parts and put them together with semantic sketches and little effort. They are the technicians among us. The field independent-convergent articulators prefer algorithmic approaches to group dynamics and demonstrate a preference for academic subjects (e.g., applied mathematics, physical sciences, computer science, statistics, etc) that require less rigorous theoretical proofs; and occupations with less human interactions. They are less prone to environmental stressors, are more likely to be weaker non-developmental learners, engage in a hypothesis-testing to concept attainment, and are more

impersonal and less alert to social order, cues, and criticisms.

Field Independent-Divergent Discriminators

These individuals are the theory builders and model developers. Their main focus is to theorize and set new inventions. The field independent-divergent discriminators are abstract-analytical, are most likely to be stronger non-developmental students, are more likely to need less time to solve a particular task, use internal referents for self-definition, need less motivational themes, are more independent on others, are likely to solve a problem intuitively, and prefer the academic subjects like mathematics, physics, astronomy, astrology, engineering, etc.

Multicultural Education Strategies, Characteristics, and Skills

Since students often influence the ways that instructors teach, a behavioral modification should be an impetus for congruent and homeostatic equilibrium in a multicultural developmental education teaching-learning classroom. In a more pragmatic account, Alexander and Dochy (1995), Alexander, Kulikowich, and Jetton (1995), Birenbaum and Kraemer (1992), Hsu and Wedman (1994), and O'Brien (1994) pointed out that if learning styles involve affective and cognitive factors that range from centering around social interaction, emotional involvement, sensory experiences, to abstract intellectual reasoning, then instructors in linguistically diverse classrooms can draw practical implications for planning their instruction. According to Alexander and Dochy (1995;), Alexander, Kulikowich, and Jetton (1995), Birenbaum and Kraemer (1992), Hsu and Wedman (1994), Ivey (1996), and O'Brien, (1994), various empirical data indicate that students can better their

Table 1

Learning Styles/Traits Dimensions and Teaching Strategies

LEARNING STYLES	LEARNING MODES	INSTRUCTIONAL STRATEGIES
Accommodator - Handyman - Action Oriented	Note Taking	Write instructional goals and objectives
	Deductive/Inductive Reasoning	Teach how to apply rules to given tasks
Assimilator - Logician - Organized Learner - Thinker	Repetitive Tasks	Make students rehearse or repeat learning tasks
	Group Dynamics	Pair students in learning clusters
Converger - Technician - Theory-based - Problem solver - Philosopher	Collaborative and Cooperative Learning	Assign group projects to students with common interest (Peer learning)
	Affective Styles	Apply interpersonal communication skills
Diverger - Socialist - Observer - Visual Learner	Contextualization	Teach discovery leaning
	Directed Learning	Gain students' focus on learning styles/traits. Apply individualized instruction

learning by adapting learning styles compatible with the target learning in diverse settings. For instance, table 1 portrays the relationships between learning styles dimensions and teaching strategies for instruction in a multicultural environment. In particular, given the cross-linguistic influences in such settings, table 1 provides certain strategies for instructors in

linguistically diverse classrooms to achieve learning homeostasis and congruence between teaching and learning.

A curriculum and teaching model based on multicultural principles can guide and empower developmental educators as they select the subject-matter content relevant to their students. Moreover, this model allows both instructors and students to set and clarify instructional goals and objectives conducive to teaching and learning. Once developmental educators give credence to all students' cultures and their contributions to humanity through multicultural education curricula activities and instructional strategies, desired and promising educational outcomes -- self-concept, augmenting motivation, affirming society's democratic pluralism, and appreciating cultural diversity will follow at the expense of cultural chauvinism.

Multicultural Instructional Strategies

Since developmental and multicultural education instruction rest on the philosophical underpinnings of multiplying and providing learning opportunities for all, congruence and homeostasis between teaching and learning for diversity could be achieved in many ways. In linguistically and culturally diverse developmental education settings, developmental educators should teach for diverse learning styles by incorporating the

Table 2

Instructional Systems Paradigms and Instructional Attributes

S/N	INSTRUCTIONAL SYSTEMS AND DESIGN PRINCIPLES (STRATEGY)	INSTRUCTIONAL ATTRIBUTES
1	Task Analysis - Learner Analysis * Needs Assessment - Instruction Analysis * Systematized * Prerequisites & Corerequisites	Inquiry about learning styles Use language differences Avoid repetitions Focus learning on students Understand students' cultures List prerequisite courses List core-requisite course
2	Instruct'l Objectives - Instructional Goal * Performance Objective * Enabling Objectives - Instruct'l Sequencing * Sequential * Cyclical * Hierarchical	Use contextual-based cues List instructional Goal(s) List performance objectives List enabling objectives Present materials in order Incorporate multimedia Emphasize all learning types Teach for diversity
3	Instructional Synthesis - Situation Cognition - Cognitive Apprenticeship - Metacognition - Multiple Perspectives * Multimedia * Multiple Multimedia * Instructional Juxtaposition	Focus on knowledge acquisition Encourage questions/critiques Use cooperative learning Juxtapose instruction Encourage conferencing Emphasize critical thinking Use group dynamics Use multiple multimedia Adopt roll models/gender roles Use reinforcements
4	Evaluation - Formative Evaluation - Summative Evaluation	Provide immediate feedbacks Use test-based on curricula Use eclectic learning approach

instructional design (ISD) principles and create a teaching-learning environment conducive to the unique learning styles of

their students (Elliot, 1976).

However, a multicultural developmental education approach to teaching for diversity does not mean treating developmental learners unequally. Rather, it means having empathy, caring for students, and treating these students equitably by attending to students' needs, nature, and demographic make-ups; understanding students' sociocultural and ethnolinguistic differences; being culturally relativistic without being ethnocentric; and centering the curricula and instructional delivery on the students by empowering the students to make their own choices about learning styles dimensions unique to their cognitive and metamemorial needs (Henderson & Landesman, 1995; Karabenick, 1996). In fact, multicultural teaching is a way of celebrating and valuing students' diversity (Galloway, Leo, et al., 1996). It is also a way of assessing students in terms of their capabilities and potentials of what they can accomplish, rather than what they cannot do.

Multicultural Characteristics and Skills

The role of a developmental educator in today's diverse classrooms has to be revisited in light of pluralizing the postsecondary institutions' culture and climate. Table 3 illustrates the dynamic roles of developmental educators in relation to their characteristics and communication skills to effect optimum classroom learning.

Furthermore, developmental instructors should take into consideration the students learning styles as well as students; circumstances and other characteristics when selecting literature, textbooks and study materials, reading assignments, and most importantly when teaching. All of these should be keenly linked to

the students' experience, expertise, sociocultural and individual background characteristics. Developmental instructors should be sensitive to the different real life situations of their students

Table 3
Instructors' Communication Skills and Characteristics

S/N	COMMUNICATION SKILLS (CHARACTERISTICS)	INSTRUCTORS' CHARACTERISTICS
1	Content Expert	- Adaptation of theory to practice
2	Motivator/Exemplar	- Application of research in classroom
3	Performance Evaluator	- Environmental/Behavioral factors
4	Goal Modifier	- Cognitive styles learning assessment/diagnostics
5	Cultural Mediator	- Physiological learning traits/styles
6	Learning Facilitator	- Learner/Student-centered
7	Experience Multimedia	- Active in field of enquiry and teaching - Flexible in teaching styles
8	Good Presentation	- Fair in student evaluation

always include the group in their curriculum map; mold their teaching strategies in accordance with the students' learning traits; and tailor their teaching methods to suit all students in their classroom (Garcia, 1991; Karabenick, 1996; McGregor, 1993).

V. Implications for Future Research

The literature is limited on the ethnicity effects of cognitive learners. The current growth in the use of mediated instruction, both in education and communication, suggests that

computer-mediated instructional presentation strategies deserve the attention of educational and instructional technologists. Continued research on how different learners use windows in computer-mediated instruction and tutorial environments will help educators and instructional technologists shape the future of literacy in America.

Research has shown that the type of window presentation style (tiled or overlapping) should be used in varying contexts. Tiled windows should be used for single task activities, and by inexperienced users. Overlapping or cascading windows should be used for switching between tasks, by experts, for non-predictable display contents, and for tasks that necessitate a greater window manipulation (Elliot, 1976; Eysneck, 1993; Galitz, 1989, 1994).

Further investigations should examine how learning styles may be "GOOD" predictors for successful performance in a computer course, particularly, with regards to specific learning tasks. In addition, a comparison of the effect of students' knowledge or lack of knowledge of their learning style on performance should be conducted. Another investigation, a combination of learner characteristics (such as gender and ability), may yield additional information about how students learn and process information. Finally, how learning styles and other learner characteristics influence performance in other course contents might be investigated as well. The differential effects of style-shifting for developmental learners is also desirable. The classification of developmental learners into the cogno-abstract-concrete continuum is highly needed. Research efforts that will investigate this classification will provide missing information about the "TRUE

NATURE AND CHARACTERISTICS" of developmental students. A potential comparison of this `new' study with the literature on learning styles dimensions will bridge the gap between "WHAT IS KNOWN" and "WHAT NEEDS TO BE KNOWN" about this population of students in America's multiculturally and linguistically diverse classrooms.

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