A PROCESS MODEL FOR THE DEVELOPMENT OF CULTURE-BASED LEARNING EXPERIENCES

DISSERTATION

Presented to the Graduate Council of the North Texas State University in Partial Fulfillment of the Requirements For the Degree of DOCTOR OF PHILOSOPHY

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Denton, Texas August, 1978

The problem with which this study is concerned is the development of a process model through which culturally-relevant learning materials could be developed. "Culture-based learning materials" are defined to be materials which take into account the child's cultural/linguistic/experiential background and his natural interests.

Through a preliminary search of the literature on factors which influence learning, certain basic factors are identified. The factors identified are schooling, environment, past experiences, and culture. Certain authors were chosen to represent each of the factors identified and a review of literature relevant to each factor is made. The literature reviewed is limited to those authors chosen.

The need for changing the school environment to be more compatible with the child's out-of-school environment is apparent. Certain literature on methods of adapting learning environments and learning materials to reflect children's "culture" is reviewed. Certain areas which materials developers can tap to establish "compatible" learning environments for culturally-diverse students are identified. The areas identified are the child's "total living-environment," his linguistic and cultural background, and the materials
should provide opportunities for experience, manipulation and cooperation.

A three part model is developed based on the findings, and an interpretation of the various components is given. The parts of the model are as follows:

-A flow diagram, presented via two configurations, which describes and organizes the components into a sequential order;

-An instrument for the purpose of collecting data on a child's living environment and experiential background;

-A geometric configuration for the purpose of systematically developing, coding, and filing the materials.

An illustration of the use of the model, for the purpose of demonstrating how to devise culture-based learning experiences via the model, is provided. Teachers of elementary school children in three school districts in northeastern New Mexico were invited to participate in the illustration. Their duty was to collect data via the instrument designed in the second part of the model. The data collected indicate that the majority of children attending these schools are "bilingual" in Spanish and English. Certain literature on teaching Mexican-American children is therefore summarized. For illustrative purposes mathematics was chosen to represent the school's curricula. Hence a synthesis of certain literature on teaching mathematics to "bilingual" children is also provided. Illustrative culture-based mathematics-
learning experiences for use by teachers in northeastern New Mexico are presented and discussed.

Based upon the activities that led to the completion of this study recommendations include:

- Bilingual-bicultural education should continue as an alternative educational plan;

- In-service and pre-service teacher training programs should include components which are designed to develop "appropriate" attitudes toward teaching minority group children, to teach teachers how to teach various content areas to culturally-different children, to develop the skills necessary for applying the process model developed in this study for the purpose of "culturalizing" the child's school experience; and

- to continue to support research for the purpose of improving educational opportunities for all children.

A teacher's guide for the development of culture-based teaching materials via the process model is included in the appendices.
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CHAPTER I

INTRODUCTION

A few years ago the United States Commission on Civil Rights reported:

From information gathered primarily through a survey of superintendents and principals in school districts having enrollments at least 10 percent Spanish surnamed, the Commission has found that minority students in the Southwest do not obtain the same benefits of public education as their Anglo peers (9, p. III).

The members urged that corrective action be taken in the spirit expressed by the President when he declared: "Nothing is more vital to the future of our Nation than the education of its children."

In response to this situation, many school districts in the Southwest implemented Bilingual-Bicultural Education Programs. The Commission's sixth and final report of 1974, however, found that many of these programs had little or no bilingual course content and/or cultural component (10, p. 6). The report showed that the findings "depict an educational system which ignores the language and culture of Mexican-American students... (Recommendations include that) the language and culture of Mexican-Americans should be an integral part of the education process" (10, p. iii).

Public education, therefore, must undergo changes that
allow the language and culture of minority group children to become an integral part of the process, if such inequities are to be eliminated. The curriculum, teaching strategies, and teaching materials must take into account the background, interests, and other cultural traits of these children. A survey of teaching materials available to teachers of Mexican-American children in northeastern New Mexico indicated that there are, as yet, no materials reflecting the local background, interests and cultural traits of these children and therefore, a study for the purpose of establishing a procedure through which teachers can develop and/or adapt culture-based supplementary materials should be of significance.

Statement of the Problem

The problem of this study was to develop a process model for creating culture-based teaching materials for use by teachers of minority-group children.

Purposes of the Study

The purposes of the study were

(1) to establish a procedural model for developing and/or adapting culture-based teaching materials,

(2) to illustrate the process model,

(3) to list selected elements of Mexican-American children's culture which can be used in creating culture-based supplementary materials,

(4) to develop new, or to adapt existing, illustrative
culture-based mathematics-teaching aids for use by teachers of Mexican-American children in northeastern New Mexico,
(5) to state the implications of the results and to make recommendations for teacher training programs.

Background of the Study

In 1963, at the request of President Kennedy, the Lawyer's Committee for Civil Rights Under Law was established. The Committee's major endeavors have included research and litigation concerning equal educational opportunity (4, p. 1). Among the early Supreme Court decisions concerning bilingual education were those addressing the constitutional rights of students to attend private schools in lieu of public institutions. In more recent years, the federal courts have addressed issues concerning the rights of students attending federally-assisted schools, as for instance, in the cases of Lau v. Nichols in California, and Serna v. Portales in New Mexico (4, pp. 2, 3). In the former, the court held that school districts having a large number of non-English-speaking minority students must provide either a bilingual program or an English-as-a-second language program. In the latter case the courts affirmed a trial judge's discretionary power to order bilingual instruction for its non-English-speaking minority-group pupils.

Several federal and state statutes encourage bilingual education. Among these are the Civil Rights Act of 1964, the Bilingual Education Act of 1967 (amended in 1974), and
the National Defense Education Act (4, p. 3). The Bilingual Multicultural Act of the New Mexico statutes (77-23-1 to 77-23-7) states the following definitions and purposes:

Section 77-23-2 Definitions

(a) "program" means a program of education by which students learn through two languages to understand and participate in the culture of their environment;

(c) "culturally and linguistically different" are those persons who are of a different cultural background than the majority culture of the state and whose native tongue is of a language other than the language of the majority culture within the state.

Section 77-23-3 Purposes

(a) The purpose of the Bilingual Multi-Cultural Education Act (77-23-1 to 77-23-7) is to ensure equal educational opportunities for students in New Mexico by:

(1) utilizing the cultural and linguistic backgrounds of the students in the curriculum,

(2) providing students with opportunities to expand their conceptual and linguistic abilities and potentials in a successful and positive manner, and

(3) teaching students to appreciate the value and beauty of different languages and cultures.

Educational settings, therefore, must reflect the child's culture and linguistic background.

Ramirez and Castañeda (3, p. 23) claim that educational environments and policies that do not permit the student "to
remain identified with the culture and language of his culture group are culturally undemocratic." They define Cultural Democracy as

a philosophical precept which recognizes that the way a person communicates, relates to others, seeks support and recognition from his environment (incentive motivation), and thinks and learns (cognition) is a product of the value system of his home and community.

Thus, if educational programs are to become more culturally democratic, they must become more responsive to the child's communication, human relations, learning, and motivational modes or styles.

Rodríguez (6, p. 7), speaking to a group of Chicano educators, quoted excerpts from the address by the Honorable Joseph M. Montoya to the United States Senate. According to Rodríguez, an "important aspect of the Senator's message for us is that without materials, curricula and trained teachers, the bilingual-bicultural programs we need will never come into existence." He adds that it is we who must take the responsibility for developing materials and curricula and for the training of teachers.

Bruner (2, p. 18) points out that developers of curricula face the obvious problem of "how to construct curricula that can be taught by ordinary teachers to ordinary students...". He claims that the problem is twofold:

(1) how to have the basic subjects rewritten and their teaching materials revamped in such a way that the pervading and powerful ideas and attitudes relating to them are given a central role;
how to match the levels of these materials to the capacities of students of different abilities at different grades in school.

Developers of bilingual-bicultural curricula have the added problem of matching the materials to the language and the culture of the students to be served. Kaplan (5, p. 4) states that cultural considerations are often neglected in establishing the instruction of various skill areas. He adds that interaction with children from a culture different from that of a school has consequences for performance, achievement, activities, materials, and instructional strategies. He also claims that there is a need "for programs which will help a culturally different child, ... to learn in key subject areas, ... for materials which take into account language and bicultural differences, for teaching strategies which reflect concerns for the bilingual-bicultural differences" (5, p. 5).

In summary, it has been noted that Bilingual-Bicultural Education is a viable means of equalizing educational opportunity. However, a need for the "culturization" of the curriculum in key subject areas has become evident.

Procedures

The following procedures were followed in order to accomplish the purposes of the study.

1. The literature on factors which influence learning was given a preliminary search.
2. As the preliminary search progressed, certain basic factors were noted, and additional in-depth reading was done on each.

3. Certain authors were chosen to represent each of the factors. They were authors of books and/or articles published for professional journals in education, psychology, sociology, anthropology, mathematics, or science. The authors chosen were those whose writings were considered authoritative by researchers and other writers.

4. A review of the literature on each factor was made. The review was limited to the authors chosen for that factor.

5. A process model for creating culture-based supplementary teaching materials was developed in the following way:

   a. The literature on supplementary teaching materials was reviewed.

   b. Certain parameters emerged as being of interest to researchers and developers. These were noted and further study of the literature on each was done.

   c. Certain authors were chosen to represent each of the parameters. An effort was made to choose those authors whose work was deemed professionally respectable.

   d. A flow diagram, based on the parameters
described in (b) above, and an interpretation of this flow diagram were discussed.

e. An instrument was developed based on the factors identified in (2) above for the purpose of collecting information on child-life with respect to these factors.

f. A geometric configuration was developed for the purpose of coding the materials.

6. Illustrative materials consistent with the information collected through the procedural model were developed.

7. A teacher's guide for the development of materials using this model was prepared and is included in the Appendix of this study.

Specific procedures will be given at the appropriate times in the following chapters. This study was a developmental study and presentation of it here will not necessarily follow the usual form of an experimental study.

Delimitations

The following delimitations were imposed for the completion of this study.

1. The review of the literature was for the purpose of utilizing data obtained from previous research, as reported in the review of the literature.

2. The review of the literature included only those authors chosen as authoritative for each factor.
3. The illustration of the model had the following delimitations:

   a. The subjects chosen for the illustration are children from school districts in Northeastern New Mexico.

   b. The illustrative materials are for use in bilingual setting in the area of mathematics.

   c. The materials are for use by children bilingual in Spanish and English.

Definition

"Culture-based teaching materials" are, in this study, materials which take into account the child's background and natural interests.


CHAPTER II

REVIEW OF THE LITERATURE

Purpose of the Chapter

The purpose of the chapter is to identify certain factors which influence learning, and to suggest a strategy through which these factors can be used to "shift the emphasis" of education.

Procedures

The following procedures were used:

1. A preliminary search of the literature on factors which influence learning led to identification of certain factors of concern to authors and researchers;

2. Certain authors were chosen to represent each of the factors identified. An effort was made to choose those authors alluded to and reviewed by researchers and writers in such a way that the work was considered professionally respectable;

3. Literature on teaching strategies and teaching materials was reviewed;

4. A strategy for "shifting the emphasis" of education via teaching materials was identified based on (2) and (3) above.
Background

The end of the last decade marked the beginning of a new outlook for American education. Changes occurred not only in the schools themselves, but also in the public's view of them. "Equal educational opportunity" became the rallying cry of various minority groups throughout the country. Their concern found its way into the courts of the United States and led to much litigation and finally to the U.S. Congress' passing of the Bilingual Education Act and the Equal Educational Opportunity Act of 1974 (1, 22).

Educators as well as laymen have since 1974 been attempting to assess the school's role in the development of the child: what the school should do for the child rather than to the child (19). This attitude has become evident in most areas of the school curriculum. In the area of mathematics, for instance, Inskeep (28, p. 256), when reporting his view of the impact Piagetian ideas have upon the teaching of mathematics, writes that for too long "we have attempted to make the child fit the mathematics rather than to make the mathematics fit the child."

Biggs and MacLean (4, p. 3) quoted Dr. Z. P. Dienes' description of the classroom situation in general: "It is suggested that we shift the emphasis from teaching to learning, from our experiences to the children's, in fact, from our world to their world."
Factors which Influence Learning

Webster (46, p. 298) defines a factor as "something that actively contributes to the production of a result."
The purpose of this section is to identify certain factors
that contribute to intellectual growth and to review briefly
some of the literature concerning them.

Schooling

Stevens (40, p. 20) distinguishes between schooling
and education. He states that the latter "can be as broad
as life itself. Schooling is considered a narrower process
linked to a more or less formal institution." It is a
process through which a culture, through an institution,
attempts to educate its members.

That schooling influences learning is an idea generally
accepted. Several studies have been reported which subs-
tantiate this belief. A series of experiments sponsored by
the Harvard Center for Cognitive Studies (10) supports it.
Bruner (9, p. 635), in collaboration with Patricia Greenfield,
Rose R. Olver, and others, explored "the role of culturally
transmitted technologies in intellectual growth by the use
of instructional techniques and cross-cultural studies."
Subjects included schooled and unschooled children from
Senegal in former French West Africa.

The studies centered around two main areas: concept
formation and conservation in the Piagetian sense. The three
major groups included rural unschooled children and adults, schooled children from the same or nearby bush village, and schooled children from Dakar, Senegal's cosmopolitan capital (9, p. 636). Greenfield and Bruner noted that the one theme appearing in all of their results is that "it is always the schooling variable that makes qualitative differences in directions of growth" (9, p. 652). Concerning intellectual development, they report that schooled Wolof children are more like schooled children living in the same country, or any other, than they are like unschooled children living in their own bush village. Bruner, and others, reported similar findings of similar studies in the Belgian Congo (Cyrns, 16) and South Africa (Biesheuvel, 3).

Other researchers report similar findings. For example, Sigel (38, pp. 510, 511) reports that schooling makes a difference in how children fare on Piagetian tasks of quantity and classification. Mermelstein and Shulman (31) found that schooling influences the conservation of skills of lower class rural and urban Negroes. Sigel and Mermelstein (39) studied a group of non-schooled Negro boys and girls in Prince Edward County, Virginia, and found that schooling made a difference in class inclusion tasks. Goodnow (24) attributed similar differences found in her studies to schooling and social class. Summarizing their studies, Greenfield and Bruner claim that "if this chapter shows anything, it is
that it makes a huge difference to the intellectual life of a child simply that he was in school" (19, p. 654). Such schooling, therefore, is a factor which influences learning.

Environment

Sigel, cited earlier, gives an example of how the environment contributes to a child's mode of thinking.

...The rural environment, for example, offers a far different array of experiences than does the urban area; living in an underdeveloped country offers far different opportunities for facing technological conditions than does living in a highly industrialized technological world. Thus the personality structure interacting with the environmental opportunities contribute considerably to the quality and pattern of children's thought...(38, p. 510).

In other words, asking a child from a rural environment to respond to situations which exist only in highly industrialized, technological urban areas is in direct conflict with his present mode of thinking.

Gagné (21, p. 4) claims that "the situations in which a child is placed are going to have great effects on him." If the situation is one which his current mode of conceptualizing cannot cope with, the effect may be negative. Also, "the factors...influencing learning are chiefly determined by events in the individual's living environment" (21, p. 3). Strauss (41, pp. 94-95), after comparing the learning theories of Gagné and of Piaget, concludes that although differences
in the theories exist, Piaget and Gagné are in accord on that one point, at least.

Copeland (15, p. 2) reported on a study by Newman, Freeman, and Holzinger in 1937. They, in determining the role the environment plays upon intellectual development, observed identical twins raised in different environments. Their results showed IQ differences as great as 24 points. They concluded that the difference was due to environment and not heredity since identical twins have the same genes. Therefore, the living environment of the child is the second factor which influences learning.

**Past Experiences**

That the child's experiences early in life influence later development is an idea dating back to the psychologist Sigmund Freud. Freud's psychoanalytic theory stresses the importance he attached to childhood experiences. Watson (46, p. 431), commenting on Freud's thoroughness in his method of bringing to surface the patient's consciousness, says that the memories "these patients were able to produce inexorably tended to go further and further back into childhood, as if somehow the patients were attached to this period of life."

Several studies indicate that early experiences influence learning. White (45), for example, in collaboration with Watts, studied young children in the environment of their
own home. This study, now known as the Harvard Preschool Project, focuses on the early life of children from birth to age six. Summarizing the study, White (45, p. 248) stated that there is much to be optimistic about concerning what they learned from the project. He claims that they had "witnessed the effective shaping of young lives at the most important formative period."

Bloom (6), in another study, after studying the relationship between changes in IQ scores in relation to age, concluded that the rate of growth is greatest during the first four years of life. He found that at this age approximately 50 percent of mature intelligence has been attained. The experiences a child has during this period of life, therefore, are great influences upon later development.

Ginnsburg and Opper (23, p. 223) report on implications of Piaget's work for education. They wrote that "Piaget's theory stresses the interaction of current cognitive structure and new experiences for the arousal of interest and the subsequent development of understanding." Interest and learning are influenced by the child's past experiences and can be facilitated if the new experience bears some relevance to what he currently understands.

Wadsworth (44, p. 117), summarizing Piaget's theory and its implications for education, states that the "early sensori-motor development is the foundation upon which later
conceptual development is built." He also said that the stages of development are interrelated. The new stages of development do not replace the old, but merely improve upon them (44, p. 62).

Bruner (11, p. 33) also supports this point of view concerning intellectual development and readiness for learning.

...Research on the intellectual development of the child highlights the fact that at each new stage of development the child has a characteristic way of viewing the world and explaining it to himself. The task of teaching a subject to a child at any particular age is one of representing the structure of that subject in terms of the child's way of viewing things.

Hence, the third factor which influences learning is past experience.

**Culture**

Herskovits (26, p. 305) reminds us that definitions of culture are numerous.

There is a general agreement that culture is learned; that it allows man to adapt himself to his natural and social setting; that it is greatly variable; that it is manifested in institutions, thought patterns and material objects.

He offers a more concise definition: "culture is the man-made part of the environment."

Greenfield and Bruner (9) state that the idea that cultural variations yield different modes of thinking is not a new one. They reported on studies on perception conducted by the Cambridge Anthropological Expedition to
the Torre Straits in 1901-1905. Their findings showed that people in that area were less susceptible to the Muller-Lyer illusions. One explanation of that is that members of that culture were not accustomed to drawing three-dimensional inferences from two-dimensional surfaces and that therefore the illusions presented little or no conflict with their mode of perception. This work which suggests that cultural conditions, such as the absence of pictures, affects perception, has been replicated in other places and these replications have shown that the explanation is a correct one. The reports lead to the conclusion that "the effects obtained appear to depend upon perceptual inference; members of different cultures differ in the inferences they draw from perceptual cues, not in the cues they are able to distinguish" (9, p. 635).

Hanson (25, p. 40), at the symposium (1971) sponsored by the University of California, Riverside, and by the United States Office of Education, stated that

...members of distinct minority groups, through culturally based socialization practices, possess culturally patterned personalities which are distinct from those of the dominant majority group. An individual therefore, responds to cues, behavioral acts, patterns of authority, beliefs, norms, instructional objectives, success expectations, and the like in relation to his culturally defined perception of the situation.

Relative to cognitive styles, Witkin (48, p. 687) suggests that the first and most obvious place to look for social influences affecting a child's cognitive development
is the cultural environment in which he grows up. He reports on cross-cultural studies conducted by Dawson, Berry and Derskowitz.

Dawson’s subjects were from the Temne and Mende tribes of Sierra Leone, Africa. The analysis showed that Temne parents, compared to Mende parents, are less encouraging of assumption of responsibility in their children and place greater stress on authority. ...Temne parents are more severe in discipline, using physical punishment rather than deprivation, and less consistent in child-rearing (48, p. 700).

His results indicate that Temne children were more field dependent than were the Mende children. That is, they responded to cues from a field as a whole rather than from any of its parts.

Berry’s studies included the Temne children and Eskimo children from Baffin Island. "The Eskimo, in contrast to the Temne, allow their children extreme freedom and rarely use corporal punishment" (48, p. 701). His findings supported Dawson’s in that the Temne were found to be more field dependent than the Eskimos.

Derskowitz, in a similar study, found that a group of highly orthodox Jewish boys of East European origin were more field independent than a group of Protestant boys. That is, the Jewish boys were found to be "significantly more global in their cognitive functioning" than were the Protestant boys. In a subsequent comparison, a third group of boys from more culturally assimilated Jewish families was
found to be more field independent than the Protestant boys but less than the highly orthodox Jewish boys. Witkin concluded that the results found in these studies suggest that "...this cognitive style may be conceived as the end product of particular socialization processes..." (48, p. 701).

Ramirez and Castañeda (14, pp. 59-79), in summarizing studies, reported differences found in cognitive styles among Mexican-American, Anglo-American, and Mexican children. For example, Kagan and Madson (29) compared the performance of the three cultures on tasks that require cooperation or competition. Mexican children performed best on tasks that required cooperation. On the other hand, Anglo-American children did best on tasks that required competition. The Mexican-American children occupied the intermediate position in both cases. Ramirez and Price-Williams (35) administered the School Situations Picture Stories Technique Test (SSPSTT) and found that Anglo-American children scored higher on achievement for self-satisfaction. On the other hand, the Mexican-American child scored higher on achievement for the satisfaction of his parents. A subsequent study (36) on human relational styles, found that Mexican-American children scored higher on need affiliation (indicating a greater desire to interact with others and belong to a social group), need to nurture (showing greater sensitivity to others' feelings and a willingness to help others), and on
need succorance (willingness to rely on others, particularly adults, for help and guidance). In summary, Ramirez and Castañeda suggest that

...differences in cultural values are reflected in socialization practices, which in turn result in differences in cognitive style between Mexican-American and Anglo-American children. That is, Mexican-American children are relatively more field sensitive and Anglo-American children more field independent in cognitive style (14, p. 79).

Krulik and Weise (30, p. 6), after discussing social and anthropological factors influencing learning, state that the ethnic composition of a school does have significance toward the context of teaching. They claim that "an understanding of the cultures that have influenced the thinking and behaviors and motivations of the children you teach will make the adjustment between you and them much easier." That is, an understanding of the child's environment will do so. Child culture is, therefore, the fourth factor which influences learning.

**Summary**

Four factors affecting the intellectual growth of young children have been identified: schooling, environment, past experiences, and culture. A process model for the development of culture-based teaching materials should be based on these four factors.

**Teaching Strategies**

Krulik and Weise, cited earlier, define a teaching
strategy as "a carefully planned procedure for presenting a lesson, with the object of securing some degree of mastery of the lesson by the students..." (30, p. 129). The purpose of this section is to point out basic characteristics of materials and procedures for presenting lessons to the culturally different child. Literature in which the basic characteristics are identified and supported is reported.

Learning Environment

The need for changing the learning environment was expressed by the Texas Advisory Committee to the U.S. Commission on Civil Rights in 1970.

We can no longer remain under the illusion that a system designed to teach a young Anglo student from Boston or Dallas will work equally well for a Puerto Rican youth in East Harlem, a Mexican-American in San Antonio or a Black student in Houston. The school systems must begin to take into account the background and special needs of their students and alter teaching methods and educational concepts accordingly (8, p. 19).

Ulibarrí (43, pp. 107-112), by means of a questionnaire, interviewed a stratified sample of 100 teachers of Anglo-American, Spanish-American, and Native-American students in New Mexico. Several items dealt with the teacher's awareness of the differences in out-of-school environments of their pupils. The results indicate that "Anglo pupils have a superior out-of-school environment; that is, one which is closer and more compatible to the school environment than that
of the Spanish-Americans or Indians" (43, p. 110). He writes that the difference between the school environment and the out-of-school environment of the child suggests that the curriculum may not be meaningful to these children. He adds that if "children have only a meager range of direct experiences to which they can relate the vicarious experiences of the classroom, the formulation of meaningful constructs is very difficult" (43, p. 110).

Ginnsburg and Opper, discussing Piaget's four factors of development, state that learning takes place only when the child has the necessary mental cognitive structure to understand new experiences. They warn that a great disparity between his current level of functioning and the new experiences will cause one of two things to happen: "either the child transforms the experience into a form which he can readily assimilate and consequently does not learn what is intended, or else he merely learns a specific response which has no strength or stability, cannot be generalized, and will probably disappear soon (23, p. 176).

The Coleman Report, the Civil Rights Commission Report, and Project Talent are three monumental federally-sponsored studies on educational issues which support the need for placing more emphasis on the sociological environment. Burger (12, p. 111) states that they demonstrate "that student achievement is influenced mainly by family conditioning, personal motivation, and the social climate of school."
Taba and Elkins (42, p. 65), discussing guidelines for instructional strategies for the culturally different, recognize that conventional instruction practices are not adequate for these students. They claim:

...The kind of experiences that are offered, the motivational devices used, the content, as well as the approaches to teaching, seem somehow to miss the mark, either because they are incompatible with the needs of such students and therefore represent meaningless drudgery to them, or because some links in their education are missing.

The classroom teacher is the learning facilitator whose responsibility it is to see that the experiences, motivational devices, and approaches to teaching become compatible with the needs and background of the student. The teacher has at his disposal curriculum guides, textbooks, and other learning devices as aids to motivate students. Taba and Elkins add: "...All students need to be motivated to learn anything at all. But what motivates them may be totally different" (42, p. 66). Castañeda (13, p. 343), quoting Dr. Mari-Luci Ulibarri claims that "change must occur not only in those classrooms in which the bilingual curriculum is being implemented, but in the entire 'ambiente' (environment) of the school" (13, p. 343). Summarily, teaching strategies must include a means of bringing together the child's learning environments: the school environment and the out-of-school environment.
Learning Materials

Aragón (2, p. 144) relates several examples which illustrate how learning materials can create cultural conflicts in the classroom.

Let's assume that it's now diet time for our first grader. His teacher knows devastatingly well how to present this particular lesson. She's learned that especially for culturally different children, you must individualize instruction. So she's given 24 of the children seat work and has six others up with our first grader in a semicircle. She also has some of the excellent teaching aids we produce in this country to support her. And she says "Children, today we are going to study diet. Our diet is made up of those things that we eat to build strong, healthy bodies." And with a rubber tipped pointer she taps the flip chart and says, "For example, a good breakfast consists of (pointing to a giant frosty glass of orange juice with a head of foam on top) orange juice for Vitamin C." Then she flips to the next chart and points to a large bowl of whole grain cereals and a loaf of bread and says, "Whole grain cereal for Vitamin B. Toast, preferably whole wheat, children." She flips that chart and concludes with "Sausage, bacon, or eggs for additional protein." No problem. That's not a bad breakfast. But our first grader is sitting in that semicircle and he's had papas fritas con chile verde, una taza de cafe con leche, y una tortilla. You know what he says to himself? He says "I understand. Those are the kinds of things I should eat. Those are the right things to eat. What I've been eating must not to too good." And the next time he comes to school with a sack lunch filled with the things he normally eats, he goes beneath the bleachers or behind the building to eat them in private so that his friends or the teacher won't perceive him as someone who does not eat the right things. Another sin of omission. I'm sure that teacher never intended to diminish the child's diet, but the result was exactly that.

Aragón (2, p. 145) offers another example of conflict between materials used in the teaching of language arts and the
culturally different child. He says:

I'll walk you through one more example. We're now in a language arts session and the teacher says to the children in the semicircle, "Children, today we are going to learn a new word. A word that is spelled f-a-t-h-e-r. It's a very special word--the name for a very important person." And the culturally different child watches as she opens the giant reader and points to a man who has just driven up on front of the house. He's got a briefcase in his right hand and he's wearing a blue serge suit and fedora. This is father. Incidentally, he doesn't have a mustache. And coming out of the house to greet him are two children named Dick and Jane and that damn dog Spot. Our first grader says to himself, "Yeah, that man is the father to that house and those children and even that dog. That's it. I understand...But my father doesn't look like that...My father must be wrong." And as the child gets older, he asks his father to let him and his girl go to a dance and says, "Please don't come and get us. We'll get a ride and be home by 11:00." He doesn't want his father to show up there looking the way he does. And as he gets older, he recognizes that his father understood all along why he didn't want him to come and get them. Boy, then it hurts.

Attempts have been made to rectify this situation. Materials have become available in languages other than English. Some authors claim their materials are adequate for multi-ethnic situations.

Douglass (17, p. 93), however, reports the findings of a study of the adequacy of so-called "multi-ethnic" teaching materials in reading. The researchers found

First, what may appear on the basis of its cover and promotional literature to be a multi-ethnic first grade reading book may, on closer inspection, contain a few significant characters of ethnic background other than white Anglo-Saxon. Second, including other ethnic groups does not necessarily imply that the environmental setting of the stories is any different than that of the traditional,
suburban-oriented series. Third, although multi-ethnic series are not generally characterized by stories in which the main activity ends in failure, some authors may have a tendency to emphasize lack of success to a greater extent in their multi-ethnic series than they do in their traditional first grade reading books.

Douglass concludes that there does not seem to be any doubt that the majority of commercially prepared materials "presently available represent a narrow 'white world' in which actual representation of minority interests, if it exists at all, is exclusively mere tokenism." He adds that teaching materials available to the classroom teacher today are designed for a national market. He further states that "regional differences and special problems, if any, of certain racial and ethnic minorities have until very recently, at least, been overlooked" (17, p. 89).

Krulik and Weise also recognize the deficiencies of mathematics textbooks when teaching culturally different children, and they caution potential teachers of mathematics. They write:

In working with culturally different students in your mathematics classes, be aware that the materials you usually employ may be unrealistic for the students. Some people blame the students, claiming the students are poor learners because of lack of background. However, these youngsters do have a background; it may simply be a different one from that of the teacher or the textbook. But it is a background nevertheless, and should be capitalized upon (30, p. 53).

Summarily, it has been noted that teaching materials can be used for bringing together the child's learning
environments, i.e., the school environment and the out-of-school environment. In addition, it has been noted that presently this is not being done.

Chapter Summary

Four factors affecting learning were identified: Schooling, Environment, Experience, and Culture. The need for changing the school environment to be more compatible with the out-of-school environment of the culturally-different child was noted. The use of teaching materials more compatible with that out-of-school environment is a possibility. However, materials presently do not reflect the environment. In some instances the materials are in direct conflict with the child's cultural perception of a given situation. It was also noted that materials currently are produced for a national market. Therefore, they do not always reflect the culture, experience and environment of the child. The teacher must therefore learn to prepare materials which are culture-based, reflecting the local culture, environment, and experience of his immediate students.
CHAPTER BIBLIOGRAPHY


CHAPTER III

THE DEVELOPMENT OF THE TEACHING MODEL

Purpose of the Chapter

The purpose of this chapter is to present a procedural model through which teachers can create culture-based supplementary teaching materials for the ultimate purpose of "culturizing" the school environment.

Procedures

The following procedures were used:

1. Literature on methods of adapting learning environments and learning materials to reflect children's culture was reviewed;

2. Those authors whose works were alluded to and reviewed by researchers and writers in such a way that the work was considered professionally respectable were chosen for sources;

3. A procedural model was developed based on the findings in (1) above;

4. A preliminary discussion on certain aspects of the model was provided for clarification purposes;

5. The model is presented in three phases, and the interrelations of the phases are explained and discussed.
Prelude to the Model

A classroom teacher has been referred to as a decision maker. Each day he must decide "what to teach, why to teach it, how to teach it, and how to determine when learning takes place" (30, p. 1). The teacher must have at his disposal an arsenal of methods and materials if he is to make these decisions effectively.

Proponents of culturally-democratic learning environments, for example, suggest the teacher should provide each child an opportunity "to learn in a style which is most effective for him and that the curriculum content should be related to his natural interests" (24, p. 53). The task of accommodating not only individual differences in the classroom but also the concept of "culturally-democratic learning environments" creates a monumental problem for most classroom teachers. Stevenson (40, p. 3) agrees that teachers should make an effort to provide students with materials and experiences that will capitalize on individual differences, but he also recognizes the dilemmas teachers are faced with. He writes, "It would therefore seem that the teacher must be a psychodiagnostician to comprehend all the factors that may contribute to differences in performance among children in the classroom."

Hanson (24, pp. 60-61) reports that more than seven decades ago William James, the noted psychologist and
philosopher, addressed the question of how to reconstruct the curriculum, considering the child's natural interests in doing so. He suggested that those concerned should begin

...with the line of his (the child's) native interests, and offer him objects that have some connection with these.

Next, step by step, connect with these first objects and experiences the later objects and ideas which you wish to instill (27, pp. 95-96).

Two decades later Dewey offered a test for determining the usefulness of teaching materials. He proposed that they should grow naturally out of some question with which the student is concerned. And, in addition, they should fit into his more direct acquaintance, in order to increase its effectiveness and deepen its meaning (15, p. 219).

The Texas Advisory Committee, mentioned earlier, suggested that educational programs should "take advantage of the prevailing differences in culture and language to enrich their intellectual content" (6, p. 19). Aragón (2) also offers a method of satisfying the requirements given by James and Dewey. After an exhaustive review of many sociological and anthropological concepts, he identified five criteria for determining a cultural group: language, diet, costume (dress), socialization patterns, and ethics. He suggests that these cultural components be reflected in the school curriculum. He says,

If we could only change our curriculum to take into account the life style and heritage of all our students, how much more valid, how
much richer our education in America would be. And the culturally diverse students could say, "Yeah, I know that. That's where I come from. I belong here. It's my school." They wouldn't have to hide anymore--they'd be a part of the school and the school a part of them (2, p. 146).

Thornburg and Grinder (42, p. 366) discuss how existing curricula could be made more appropriate for culturally different students. One suggestion is to create new courses which deal with the heritage and culture of those students. A second suggestion is to include "more relevant cultural and regional materials into existing courses in order to give a greater percent of the student body a stronger sense of belongingness to and identity with their school and community."

Several areas where changes in the curriculum could be made have been suggested. For instance, Arciniega (3, pg. 24) claims that the learning environments should include more than the school site. He says that "school systems need to legitimize also the need to incorporate what the total community has to offer to the learning experiences of all youngsters." In other words, the school curriculum should concern itself with the child's total living-environment.

Crow (14, p. 69) supports this attitude in saying that "the skillful teacher needs to study the pupils to discover whatever he can about their home influence, their early associates, their opportunities for being with others, the extent of their exposure to books, toys, children, and adults
and the like." He states that children build their attitudes as they live among people, and places and things. Thus, the child's living environment should be reflected in the curriculum.

Several suggestions are found in the literature concerning types of materials. Piaget's theory of intellectual development offers some inferences. According to the theory, each child passes through the following four stages:

<table>
<thead>
<tr>
<th>Stage</th>
<th>Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Sensori-Motor Stage</td>
<td>0-2 years</td>
</tr>
<tr>
<td>II. Preoperational Stage</td>
<td>2-7 years</td>
</tr>
<tr>
<td>III. Concrete Operational</td>
<td>7-11 years</td>
</tr>
<tr>
<td>IV. Formal Operational</td>
<td>11-</td>
</tr>
</tbody>
</table>

The sensori-motor stage is characterized primarily by reflex actions such as sucking, grasping and jerking. The child at this stage learns concepts of space, time, and causality by manipulating and observing his environment. Language begins to appear toward the latter part of this stage.

The child's thinking during the second stage is described by Stendler (39, p. 29) as follows:

1. The child is perceptually oriented, he makes judgements in terms of how things look to him. ...

2. The child centers on one variable only, usually the variable stands out visually. He lacks the ability to coordinate variables. ...

3. The child has difficulty in realizing that an object can possess more than one property and thus can belong to several classes at the same time. ...
The child at this stage is confused by the way things "look" and is not capable of multiple classification. When presented with a set of buttons (ten red and five not red), for instance, and asked if there are more buttons or more red buttons, the child, unable to classify the red buttons as also belonging to the set of buttons, will answer that there are more red buttons than buttons.

Given a few years time and experience, the child will cease to be misled by what he sees and instead will be able to make judgements based on "reason" rather than "perception." During this stage of development, the "concrete operational" stage, the child manipulates or transforms mentally the information given to him in a concrete way. Underhill (44, p. 7) discusses the following limitations on child's thinking.

1. He is tied to the concrete here-and-now. The starting point is always the real rather than the potential—given a problem, he cannot formulate all the possible alternatives at the outset and appraise them one at a time.

2. He is still bound to the concrete and must achieve conservation of attributes one at a time (area, time, mass, volume, etc.). He gradually learns that length, area and quantity are the same regardless of position. ...

3. The operational systems do not form an integrated whole which allows management of complex tasks.

During this stage the child is not yet capable of thinking in an abstract fashion, but can reason logically in a concrete way.
The final stage, formal operational, Copeland (13, p. 30) summarizes as follows:

...The child now reasons or hypothesizes with symbols or ideas rather than needing objects in the physical world as a basis for his thinking. He can operate with the form of an argument and ignore its empirical content. He can use the procedures of the logician or scientist--a hypothetic--deductive procedure that no longer ties his thoughts to existing reality.

The child tackles new problems by considering all the possibilities and then determining which hold true through experimentation and logical analysis rather than through concrete analysis.

Children in the elementary grades are predominantly in the third stage of development, namely, the concrete operational stage. The child's learning experiences in school should therefore include materials which accommodate this stage of development.

Several educators are in accord with this concept. Kamii (29, p. 199), for example, discussing the relevance of Piagetian ideas to educational practice, states that learning should be an active process. She reports that Almy (1), Chittenden (12), Ginnsburg and Opper (21), and others have all emphasized this point. She adds that Duckworth (17) highlighted Piaget's statements on education when he stated that

As far as education is concerned, the chief outcome of this theory of intellectual development is a plea that children be allowed to do
their own learning...You cannot further understanding in a child simply by talking to him. Good pedagogy must involve presenting the child with situations in which he himself experiments. ...(17, p. 2).

Mager (33, p. 7) agrees that teaching involves more than simply talking. He claims that "if telling were the same as teaching, we'd all be so smart we could hardly stand it."

Bruner (44, pp. 10-11) discusses three types of knowing: enactive, iconic, and symbolic. The first, enactive, is knowing through muscle movement such as in riding a bicycle, throwing a stone, fishing, etc. The second, iconic, is being able to visualize an object with the mind without actually seeing the real thing, but by the use of some visual or other sensory organization stimuli, as when seeing a picture of a mountain range, for instance, and visualizing with the mind a mountain range. The third type of knowing, symbolic, is being able to visualize an object mentally when the stimulus is a representation in printed words or verbal communication. Being able to visualize with the mind a mountain range, for example, after reading or hearing the words "mountain range."

Underhill (44, p. 9) discusses three types of learning stimuli corresponding to Bruner's three types of knowing. Concrete stimuli are experiences with real concrete objects such as trees, toys, buttons, etc. Semi-concrete stimuli are contrived examples, usually pictorial, of objects in the real world. Abstract stimuli are usually
verbal or printed stimuli.

The young child encountering a concept for the first time should be exposed to a large degree of concrete experiences, some semi-concrete experiences, and little abstract experience. This continuum is depicted in Figure 1.

Young Child

![Figure 1](image)

The older child, on the other hand, assuming he has encountered the concept previously, requires less concrete stimuli and more semi-concrete and abstract experiences as depicted in Figure 2.

Older Child

![Figure 2](image)
Summarizing, Underhill states that the "fact which cannot be over-emphasized, however, is that all children need concrete experiences throughout elementary school. Older children may need less than younger children, and intellectually astute children may need less than slow learners, but all should have some."

Perhaps so, but how does one develop learning experiences based on these concepts? Fantini and Weinstein (19, pp. 346-347) offer the following "cone of experience" for developing materials for the disadvantaged.

![Cone of Experiences Diagram]

They suggest that "a curriculum for the disadvantaged must
begin as closely as possible to the pupil's direct experience; without such an approach, the abstract cannot be attained." They also suggest that the cardinal rule could be "Experience first; we'll talk later." The aforementioned scholars all claim that the teaching approach of most schools is unfortunately at a position furthest from concrete experiences, that is, via talk and the printed word.

A second principle derived from Piagetian ideas is that of interaction between children. Kamii (29, p. 200) says that Piaget strongly believes that "for intellectual development the cooperation among children is as important as the child's cooperation with adults." Almy (1, p. 138) and others suggest that "small groups of children might be assigned to work together, not, as is so often the case, merely carrying on parallel activities, but actually sharing them." Copeland (13, p. 13) states that Piaget would agree with Dewey that children need to experience things for themselves. He adds that good teaching "will involve providing an environment in which children can try things out for themselves and find their own answers." Taba and Elkins (41, p. 15) add that "research on the cognitive style and language patterns of culturally deprived children suggests the need to capitalize on materials and tasks that use the operational and concrete, rather than verbal stimuli."

Therefore, activities which provide an opportunity for
interaction, manipulation, and for cooperation must be available to the elementary school child.

A third dimension is found in the literature. Hogg and McComb (26, p. 35), when discussing cultural pluralism and its implications for education, suggest that the educational process must adapt to cultural variations. They add that given "the existence of varying cultural traditions, and assuming that a setting's institutions are formal and enduring manifestations of local culture, then the school and the educational process must formally adjust to extant pluralism, if they are to retain their institutional character."

Douglass (16, p. 98) suggests that appropriate teaching materials must reflect the language of the learner. He claims that "it must become the vehicle for communication and thought in the school setting. It is the prime teaching material." Engle (18, p. 1) reports that assembled experts in a UNESCO Conference (1953) concluded that the native tongue of the student is the best medium for teaching. The UNESCO definition of the native language, vernacular language, or first language "is a language spoken by a subgroup and it is not the dominant language of any country" (18, p. 2). Piaget (23, p. 29), in an interview, discussed the importance of the role the child's language and activity play on the teaching of some key mathematical ideas. He says, "But when you teach set theory you should use the child's actual
vocabulary along with the activity, make the child do natural things."

Peña (8, p. 36), however, states that language alone is not enough. He claims that "poor instruction is not improved when given in another language; it is just less conspicuous..." Mazón (34, p. 3), discussing educational designs for Bilingual/Bicultural Programs, makes similar statements when he reports that

Bilingual/Bicultural education is not simply the translation of traditional materials into the target language. Nor is it teaching subject matter in a foreign language. Bilingual/Bicultural education implies the acceptance of a particular frame of reference from which to approach the education of both linguistically/culturally different children themselves, as well as those who will guide their learning experiences.

Dr. Mari-Luci Ulibarri (8, p. 385) agrees that the translation of materials from one language to another is not sufficient. She claims that "teaching materials, types of classes, activities available for students,...should all reflect the personality of the student body." Mazón (34, p. 4) also urges schools to accept that the "linguistically and culturally oriented child comes to school with a different linguistic, cultural, experiential and conceptual background from that of his English-speaking peers;..." and that the schools should use these assets constructively.

Thus, the child's cultural and linguistic background must be reflected in the school's curriculum. Perhaps so.
But how does one reflect the child's culture in teaching materials? What are the culture-matching strategies for creating culturally democratic learning environments? Hanson, (17, p. 64) describes a culturally-democratic learning environment as a situation where the student is permitted to learn in his preferred learning style, preferred mode of communicating, preferred mode of relating, and also, to avail himself of educational experiences which are relevant to his needs and organized around his natural interests.

In summary, the literature reviewed in this section identified three areas of concern which materials developers can tap to establish learning environments for culturally diverse students: materials should reflect the child's "total living-environment," his "linguistic and cultural background," and should provide opportunities for experience, manipulation, and cooperation. A concrete-semi-concrete-abstract continuum describing the types of experiences a child should be exposed to was also presented and discussed.

The Process Model

A process model for creating culture-based supplementary materials is presented in this section. The model is discussed in three parts.

First, a flow diagram which describes and organizes the steps into a sequential order is presented via two configurations.
Second, an instrument for the purpose of collecting data on a child's living environment and experience is presented.

Third, a geometric configuration, a cube, used for coding materials is discussed.

Introduction

Ausubel (4, p. 6) summarized the factors affecting intellectual development when he stated,

If I had to reduce all of educational psychology to just one principle, I would say this: the most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly.

Miller (35, p. 8), when discussing models of teaching in affective education, organizes his theory around Joyce and Weil's (28) concept of a teaching model. A teaching model, according to the concept, is "a pattern or plan which can be used to shape a curriculum or course, to select instructional materials, and to guide a teacher's actions."

The following three part model is a plan which can be used in the development of culture-based materials.
The Flow Diagram

The flow diagram is presented by two configurations, Figures 1.1 and 1.2. The former depicts the initial actions the materials developer should perform. The latter depicts the follow-up activities, specifically, those leading to the materials development. An explanation of the various components of the diagram follows.

![Diagram](image-url)

Figure 1.1
Explanation of the Flow Diagram

The initial actions depicted by Figure 1.1 are accomplished in three phases.

1. The developer should take inventory on child-life in the given community. The inventory is described later in the second part of the model.

2. The developer should examine the teaching materials available for the current year's students.

3. If the examination indicates that the materials do not reflect adequately child life in the given community, then the developer should prepare materials to remedy this situation. This process is described subsequently and is illustrated in the next chapter.

Figure 1.2 depicts the follow-up activities leading to the materials development and is accomplished in three phases.

1. The content area for which the materials are intended must be identified. Perusal of materials for adaptation or simply ideas should be conducted at this point.

2. The elements of child-life in the given community, identified in second part of the model, to be reflected in the materials should be selected. Note that the arrows indicate movement in both directions at this level, and note also that entry or exit from this level can be gained at any point. This is to be decided by the developer when the decision has been made concerning which elements are to be used.
3. At this level the developer is to develop the materials based on the decisions made in (1) and (2) above.

The second part of the model is an inventory through which information about child life in a given community can be obtained. The purpose of the inventory is to aid the materials developer in the identification of specific elements of the child's living environment. Much of the information should be solicited from the children. One technique which is often used in interviewing is to ask grand tour questions. For example, "Would you show me around your play yard?" As the child moves from place to place he might name places and things someone else might overlook. Or, he might mention activities that might take place in these areas. These are clues as to how he functions in this environment. Not all grand tour questions involve movement. An example of one that does not is "What do you do on Saturdays? Begin with the moment you get up and tell me all that you might do, who you might see, and so on until you go to bed at night."

Structural questions are also used in soliciting information from young children. These questions usually begin with "What are all the different ways of...?", or "What are all the different types of...?"

The child-life inventory is presented in the following section.
The Child-life Inventory

The instrument is designed to assist in identification of specific elements of a child's living environment and experiences. Some of these elements are to be used in the development of culture-based teaching materials.

The specific elements of the inventory follow (25, 36, 38).

I. The Community

A. Setting

1. In what type(s) of physical environment(s) is the community located?
   a. forest
   b. desert
   c. mountains and valleys
   d. plains
   e. other, specify

2. What is the settlement pattern?
   a. dispersed homesteads
   b. compact villages
   c. town or city
   d. other, specify

3. What are some of the major subcommunities?

4. What are some of the bodies of water, parks, other points of interest, or distinguishing features?

5. Rough sketch a map indicating the above.

B. Population

1. What is the population number?

2. What is the ethnic composition?

3. What are the subsistence technologies?
   a. farming and/or ranching
b. migrant, specify
c. governmental, specify
d. industrial, specify
e. commercial, specify
f. other, specify

4. What activities are practiced which do or which might include the child?
   a. social
   b. cultural
   c. subsistence
   d. other, specify

5. What languages are used for communication?

6. Specify any other potentially useful conditions not asked for above.

II. The School

A. Setting

1. Describe the area surrounding the school. List what might be seen from the middle of the school grounds.

2. List the grade levels and the number of classrooms per level in this school.

3. Specify other pertinent conditions not called for above.

B. Population

1. What is the school enrollment?

2. What is the ethnic composition?

3. What languages are used for communication?

4. What play activities are practiced during recess, lunch, etc.?

5. What is the child's grade level?

6. How many adults are assigned to this class? Specify their roles.

7. How many children are assigned to this classroom? Specify the number of boys and number of girls.
8. What languages are spoken by the children in this classroom?

9. What is the ethnic composition?

10. Specify other pertinent conditions not asked for above.

III. The Home

A. Setting

1. In which subcommunity does the child live?

2. What is the immediate environment?
   a. plant life
   b. animal life
   c. fences
   d. corrals
   e. commercial area
   f. residential area
   g. rural area
   h. other, specify

3. Specify other pertinent conditions not called for above.

B. Family

1. Specify the number of adults and their kinship to the child.

2. Specify the number of boys and of girls and their kinship to the child.

3. Specify the subsistence technology or technologies.

4. Describe the child's activities or actions.
   a. at work
   b. at play, alone or with others
   c. other, specify

5. Describe any other pertinent conditions not listed above.

The inventory is only an outline intended to facilitate the collection of data. The investigator is free to choose any other instrument for this purpose.
The Coding

The third part of the model consists of a procedure for systematically developing, coding, and filing culture-based teaching materials. Concept, environment, and language are three parameters by which any culture-based material can be categorized. In other words, all such materials are designed to teach some concept, are cast in some physical environmental setting, and are written in some language. A three-dimensional configuration and its ordered triple description is therefore suggested for this purpose. (See Figure below).
Teaching materials coded (2, 3, 1), for instance, are useful in teaching the concept identified by row 2, are cast in a community setting, and are written in the child's dominant language. (See cell X). On the other hand, material coded (1, 2, 3) is to be used in teaching the concept specified by row 1, is cast in the child's home environment, and is written in the child's vernacular language. (See cell Y).

In summary, teachers must prescribe suitable learning activities at any given moment. The coding and the configuration facilitate the identification of teaching-materials reflecting specific elements of the parameters mentioned earlier: concept, environment, language. The coding scheme, i.e., the cube, should therefore, be in a convenient location for quick reference by the user. In addition, the culture-based materials should also be filed according to this scheme. That is, by rows, then columns, then layers. Specific illustration of such materials are given in the following chapter.

Chapter Summary

The review of the literature identified two areas which should be represented in the schools, namely, the child's total living-environment, and his linguistic and cultural background. A model for developing materials which reflect the above was also presented. The model consisted of three major components: A flow diagram, an
instrument to be used for the purpose of collecting data on child-life, and a geometric configuration for coding the materials. Some discussion and explanation of the model was also provided.
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CHAPTER IV

ILLUSTRATION OF THE MODEL

Purpose of the Chapter

The purpose of this chapter is to illustrate the use of the model, to demonstrate how to design learning materials and learning experiences based on data collected through the child-life survey, and to design learning materials for use by children in northeastern New Mexico.

Procedures

The following procedures indicate the approach used.

1. Teachers of elementary school children in three school districts in northeastern New Mexico were invited to participate in the illustration. Their responsibility was to collect data on three children in their classroom through the school year of 1976-77. Instructions (Appendix A) were sent to each teacher along with the Child-Life Inventory and a letter of permission (Appendix B) to be signed by the children's parents. The data collected by each of these teachers were similar in nature, therefore, only one account is reported in this chapter.

2. The findings in (1) indicated that the majority of the children, in this case, are Mexican-American and bilingual in Spanish and English. Literature on teaching Mexican-
American children was therefore summarized.

3. For illustrative purposes mathematics was chosen as the content area and thus a summary of teaching mathematics to bilingual children is given. In addition, commercially prepared supplementary mathematics-teaching materials were selected as examples for adaptation and/or ideas.

4. Illustrative teaching-materials for use by teachers of bilingual/bicultural children were designed based on (1), (2), and (3) above.

5. The illustrative materials were coded according to the three-dimensional cube described in the third part of the model.

Delimitations

The illustrative materials designed for the purpose of creating more culturally-democratic learning environments had the following delimitations and/or limitations.

1. Children from three school districts in northeastern New Mexico were chosen to represent the school population.

2. The children selected were students in the elementary grades.

3. The content area chosen to represent the school's curriculum is mathematics.

4. The languages chosen for writing the bilingual/bicultural materials were Spanish and English.
5. The materials do not illustrate all topics presented in the elementary school mathematics curriculum.

6. The designer of the illustrative materials was not a typical elementary school teacher.

7. The materials do not represent a panacea for the education of bilingual/bicultural children.

Instrumentation

The purpose of this section is to report on the data collected about child-life in a northeastern New Mexico community. Some of the elements described here are reflected in illustrative culture-based materials presented in a subsequent section. A brief description of the cooperating teacher and the technique asked for collecting the data is also provided. The account was synthesized for reporting purposes.

The teacher-participant was a first year teacher of a first grade. She received a BA in Elementary Education and an MA in Bilingual Education. The data were collected primarily through child interviews, home visits, and articles found in the school newspaper concerning the history of the community.

I. The Community

A. Setting--The community is located in a valley in the heart of the Sangre de Cristo Mountain Range. The original settlement was colonized in 1751. The valley is surrounded
by rolling hills, forests and mountains. The settlement pattern is a mixture of semi-compact and some dispersed homesteads throughout the valley. Most of the homes are situated near the main highway through the valley and are constructed of adobe with pitched roofs for weather resistance during the long winter snow storms. Major subcommunities are located at points A, B, C, D, E, (see sketch).

Points of interest within or near the community include Indian Ruins, a Pueblo, and two rivers. Nearby are a picnic area, ski lodge, and an enormous dormant volcano.

Sketch of the Community
B. Population--The population in the valley numbers approximately 4,000. The majority are bilingual in Spanish and English. Subsistence is gained by working for the local schools, the forest service, the highway department, and/or government assistance. Most families supplement income by ranching or farming for personal use and raising livestock to sell in the open market.

Children's activities in the valley range from participating in the subsistence technologies to celebrating the annual San Lorenzo Fiestas in August. Some of their actions include gardening, adobe making, bringing wood from the mountains, caring for the animal life, chopping firewood, fetching water, picking fruits and vegetables for freezing or canning purposes, and gathering alfalfa. Other activities include snow sledding, skiing, picnicking with friends and relatives, attending wedding feasts, graduation feasts, baptismal feasts, horseback riding, fishing, and simply running through the fields, orchards and mountains.

II. The School
A. Setting--The elementary school is situated at the base of the rolling hills. The immediate area surrounding the school includes hills, secondary school structures, and a Forest Service Station. From the school grounds can be seen the beautiful mountains, including the Peak mentioned earlier. Small "barrancos," "jaras," sagebrush, fences,
tumbleweed, and alfalfa fields can also be seen.

The school includes grades K-6 housed in six buildings. The kindergarten building has three classrooms, one reading room, and one room for migrant children. The primary building houses the first, second, and third grades. There are two classrooms of each. Also in this building are a Johnson O'Malley room for Indian children, a resource room, and a special education room. The intermediate grades are housed in the remaining buildings, three of which are portables.

The classroom is located in the primary building. It is a first grade class sharing open space with two other classes. Portable partitions are used to separate the three areas.

B. Population--The elementary school enrollment is 327. The majority of these students are Spanish surnamed and are bilingual in Spanish and English. Children play with the usual playground equipment and have other games which involve much movement. For example, there is "frozen tag," where one person is it and tries to tag the others running after them; a tagged person becomes "frozen," not being allowed to run any more. The children also enjoy digging tunnels in the sand box, making cars of rocks or small pieces of wood, and racing them on race tracks made of sawdust. They like to slide down the "barrancos"
during the snow season they make slides on the snow and slide down the hillsides.

The classroom contains two adults, a teacher and a teacher's aide, both female. There are 8 boys and 10 girls assigned to this room. The majority of these children are bilingual in Spanish and English.

IIIa. The Home (Child X: Seven year-old boy)

A. Setting--The home is located in subcommunity A and surrounded by wild grass, alfalfa, lilac bushes, dandelions, 13 apple trees, and a huge alamo tree. Animal life includes a pig, two dogs, and two cats. Nearby can be seen horses and mules. Two ditches are located near the house, they are used to irrigate the gardens and alfalfa fields. In the yard can be seen wood piles, dirt piles, posts, piles of rocks, old tires, and a structure for lifting engines from cars.

B. The family includes a father, a mother, and four children (two boys and two girls). The father is employed by the school system and supplements his income by planting vegetables for his own use, he fixes cars and trucks and makes wood sculptures.

The children's responsibilities include house-type chores, feeding the pig, caring for younger children, planting vegetables, upkeeping the garden, fetching wood, gathering alfalfa, helping father with the wooden sculptures by sanding them, fixing fences, and handing him tools while he is fixing
cars or trucks.

The children play various games including hide-and-go-seek and use branches of the alamo tree as "ponies;" they dam up the ditch so as to have a small pool for wading, play with sling shots, and splash water in the ditch by throwing rocks. This child also enjoys drawing pictures, copying sentences from books, playing jacks, jumping rope, and spraying water out of the fruit tree sprayer.

IIIb. The Home (Child Y: Seven year-old boy)

A. Setting--This child's home is situated in subcommunity E. The surrounding area includes acres of pastures and alfalfa fields, six small apple trees, willow trees, choke cherry trees, two larger cedar trees, one of which has a two story tree house built on it. The immediate environment also includes fences, a ditch, gravel, two small culverts where water for irrigation purposes passes through for the garden and alfalfa fields, and a small lot used for gardening purposes.

B. The family unit includes a mother and her two sons. The mother is employed by the school district and supplements the family income by growing vegetables and selling bales of hay from her alfalfa fields.

The children's responsibilities include house-type chores, taking care of the vegetable garden and irrigating the alfalfa fields. They enjoy playing in the tree house,
making mud clods, riding bicycles, sending boats and sticks floating in the water. They make dams in the ditch, make pulleys out of disposed aluminum cans by tying a string to them and throwing them over a branch of a tree, and then they pull water out of the ditch (like from a well). The children also play baseball, soccer, and basketball. They like swinging from the trees (playing Tarzan or pirates) in the area where dense willows are located. They refer to this area as the "Enchanted Forest." Other activities include panning for gold in the ditch, running relay races through the alfalfa fields and hitting targets with the mud clods they make.

The child enjoys looking at the mountains, passing airplanes, birds, cars, and neighbors through his binoculars and telescope from the tree house. He likes to dig holes, play on swings, measure and find directions with his compass. He also buries "old strange things" he finds so that no one else will find them.

IIIC. The Home (Child Z: Seven year-old boy)

A. Setting--This child's home is located in sub-community D about three miles from the main highway. Plant life in the vicinity include alfalfa fields and apricot, cherry, plum, peach, and apple trees. There are also acorn trees, "jaras," rosa castilla, chamiso, milkweeds, and grasslands. Animal life includes horses and cows. Fences, two ditches, rolling hills, corrals, and an adobe house being constructed
are also in the area.

B. The family unit includes a mother, a father, a grandmother, and five children (three girls and two boys). The father works for the schools and also farms vegetables for family use.

The children's responsibilities are to bring in firewood, help father bring wood down from the mountains, help irrigate the garden, hoe the garden, plant flowers, chop wood, clean the ditch and take care of the younger children. The children enjoy playing with homemade boats in the ditch; they dam up the ditch and bathe in it; they look for bird's nests in the hills on the trees to see the bird's eggs and baby birds; they have an old chicken coop where they play house, and they also enjoy sliding down the hillsides. This child likes to play with paper boats in the ditch, look for pretty rocks and fossils and bones in the hills.

Summary

The data collected by a cooperating teacher were reported. (The data reported by the other cooperating teachers were similar to those accounted here and therefore are not included in this synthesis). The inventories indicated several things concerning child life in this northeastern New Mexico community. For instance, the setting is predominantly mountainous, the community is for the most part rural in nature, subsistence technologies include farming/ranching activities, and children
participate in all aspects of family life ranging from subsistence activities to attending annual or occasional feasts with their parents. In addition, the children are predominantly Mexican-American and bilingual in Spanish and English.

Some of these elements are reflected in the learning materials presented in a subsequent section.

Prelude to Materials

The purpose of this section is to summarize literature on the teaching of mathematics to Mexican-American children. Ramirez and Castañeda (4, p. 79) summarize research on the learning style of Mexican-American children. They report that

Research has shown that Mexican-American and Anglo-American children perform differently on cognitive tasks as well as on tasks reflecting incentive-motivational and human relational styles. These findings can be explained by the conceptual framework of field sensitivity/field independence. ... Mexican-American children are relatively more field sensitive. ...

Castañeda and Gray (5, p. 204) discuss a description of the term "field sensitive" given by Witkin, Dyke, Paterson, Goodenough, and Karp (24) which emerged along with the term "field independence" from their research on perception. They state that

...field sensitive children do best on verbal tasks of intelligence tests; learn materials more easily which have human, social content, and which are characterized by fantasy and
humor; are sensitive to the opinions of others; perform better when authority figures express confidence in their ability; and conversely, perform less well when authority figures doubt their ability.

Castañeda (3, pp. 24-25), when discussing the educational needs of Mexican-American children, offers the following specific recommendations developed by the Model Follow Through Project of the Cucamonga, California school district.

1. Humanize the curriculum, especially when teaching math and science concepts.
2. Personalize the curriculum: relate personal experiences and interests of children to the curriculum.
3. Include fantasy and humor in the curriculum. Use puppets and role playing techniques.
4. Encourage cooperative group work.
5. Arrange the classroom so that it permits maximum adult and child contact. A classroom with learning centers permits some children to work alone, thus enabling the teacher to work with small groups or individually with children who need personal contact.
6. If a class is too large, implement cross-age teaching.
7. Be sensitive to the child's feelings, remembering that a child-centered rather than a task-centered approach is more effective with traditional Mexican-American children.
8. Use personalized rewards which make your relationship with the child closer: "I am proud of you," or "Now that you can read that book, we can both read it together."
9. Use as much Spanish as possible in the classroom. Try to obtain Spanish-as-a-second-language material for the children.
10. Most traditional Mexican-American children need
Introduce Mexican, Mexican-American, and Spanish heritage materials into the curriculum. Asking the parents' help is a good way to involve them actively in the educational process.

12. Make educational materials available to parents so they can instruct their children at home.

Mathematics educators, bilingual specialists, curriculum consultants, classroom teachers, and mathematicians responded to the above recommendations with respect to mathematics instruction at a conference in El Paso, Texas in October of 1973. "How can we significantly improve the achievement level of bilingual students in mathematics?" (8, p. 1) was the question addressed by these scholars.

The participants made recommendations concerning the nature of the materials to be used. They suggested that...

...the most promising materials seem to be those (1) that accommodate English--or Spanish--dominant children, especially during their first years in school, (2) that are cast in a multisensory format, (3) that facilitate individualization, and (4) that provide alternative avenues to concept attainment and the mastery of techniques and skills (8, p. 1).

They also suggest that translation of materials should be done with caution and advisement.

Three years later, in February of 1976, the National Council of Teachers of Mathematics held a regional meeting again in El Paso. At this meeting, several presenters discussed Piagetian Theory and its implications for mathematics instruction. Lamb (16, p. 5), for example, stated that "Piaget opposes mathematics being taught as if it were
only a collection of truths that is reached through an abstract language. Mathematics learning involves a set of actions exercised on things." He further says that

Schooling in mathematics should begin in nursery school with exercises related to numbers, lengths and surfaces. These concrete activities should be enriched and developed in a systematic way until, at the secondary level, the child is capable of formal thought (16, p. 6).

He continues, "children should be guided to deal with objects and act upon them. These early experiences will help to build the deductive intelligence mathematicians are looking for."

Krulik and Weise (15, p. 54) support this notion when they state that mathematics learning with these children should include physical, hands-on type material; and that "the teacher must design materials and activities using concrete materials. These should be based as much as possible on the backgrounds and experiences of the students."

Graham (9, p. 157), suggests that the misconception that "all a teacher needs to teach mathematics is a blackboard and a piece of chalk" is perhaps the reason why many children leave school without the mathematics understanding they should possess. She claims that in developing an abstraction, you should begin with concrete examples, and that the child's senses, particularly his sense of touch, should be involved. That is, when teaching the culturally-different pupil mathematics many experiences with concrete materials
should be used. She cautions, however, that this "does not mean that his arithmetic should consist of a series of games and puzzles. There is a danger that the beauty and logic of mathematics will be lost in the fun." Bernal (2, p. 10), a participant in bilingual mathematics conference mentioned earlier, also warns that not all mathematics instruction should be in the concrete or field-dependent form. He states that "extended math instruction in a FD mode may be unfeasible or undesirable." He adds that the "intellectual paradigms of mathematics may not be suitable or efficiently mastered through FD modes alone."

Mathematics-teaching materials, therefore, should be designed to allow the culturally-different child to proceed through the concrete-semi-concrete-abstract continuum according to his level of understanding. Sample materials are presented and discussed in the following section.

Mathematics-Learning Materials

The purpose of the following activities and suggestions is threefold:

1. to introduce and/or reinforce certain mathematical concepts and skills,
2. to "culturize" the basic-mathematics curriculum, and
3. to demonstrate how to use the information collected in previous sections of this study for accomplishing (1) and (2) above.
McNeil (17, p. 3) described learning experiences as learning opportunities, learning activities, or instructional intervention and claimed that they are the essence of education. He adds that "field trips, dramatizations, textbooks, films, debates, experiments, games, and the like can be the means by which learners both experience valued aspects of life and acquire desirable concepts, skills, and attitudes." The following learning experiences reflect certain aspects of an elementary child's living environment, language, and/or learning style inferred from the writings of Piaget, Bruner, Ramirez, and others discussed earlier in this paper. The subsequent section describes the coding used for identifying the illustrative culture-based learning experiences.
Coding

For illustrative purposes the elementary mathematics curriculum is represented in three parts: Pre-Number Concepts, Number and Operations, and Geometry and Measurement. The materials that follow are coded as determined by the configuration below. Materials coded (4, 3, 1), for example, are to be used in teaching some geometric concept, are cast in the home environment, and are written in the Spanish language.
Unit 1. Pre-number, Sets

Introduction

The concept of sets, relations and operations form the structure of every mathematical system. The set idea is widely used in the teaching of mathematics as evidenced by most contemporary elementary mathematics texts. Key fundamental concepts such as "equivalence," "more than," and "less than" can be introduced and/or reinforced by a variety of child activity.

Purpose of the Activity

The purpose of this activity is to expose the child to the mathematical concepts of comparison and order through the simplest and most natural mathematical notion--one-to-one correspondence. Further mathematical development depends on a firm understanding of these primitive ideas.
Activity A: The Chicken Coop

Discussion--This activity, as indicated by the coding, is for use in the teaching and learning of pre-number concepts, reflects natural activities performed in the child's home environment, and is written in the child's secondary language, English in this case. The activity also illustrates a concrete experience, that is, one in which real concrete objects are used.

Materials Needed--Egg carton(s), eggs (plastic or hard boiled could be used), dried hay (dried grass or artificial grass could also be used).

Procedures--
1. Prepare several nests of dried hay in some area designated as the chicken coop (indoor or outdoor).
2. Distribute 12 eggs throughout the nests and ask the child(ren) to complete the following:

   The Chicken Coop (1, 3, 2)
   a. Go to the chicken coop and collect the eggs from the nests. Place them in the egg carton(s), and answer the following questions.
   b. Is there an egg for each cup?
   c. Is there a cup for each egg?
   d. Are there more eggs than cups, more cups than eggs, or are there just as many eggs as there are cups?
3. This time place more than 12 eggs in the nests and ask the child(ren) to complete the activity again.
4. Now place less than 12 eggs in the nests and ask the child(ren) to complete the activity once more.

5. Follow-up Activity--Discuss the concepts of equality, "more than" and "less than", with the child(ren). Provide other semi-concrete and/or abstract situations. Ask the child(ren), for example, to sketch a drawing showing more eggs than cups, less eggs than cups, and just as many eggs as cups. From these sketches you can determine if the child has understood these concepts and prescribe other activity.
Activity B: Los Fardos  
Code: (1, 3, 1)  

Discussion--This activity is also for use in presenting pre-number concepts, reflects activities observed or performed in the home environment, but is written in the child's primary language, Spanish. The activity is semi-concrete in nature in that concrete objects are used to represent other objects seen in the home environment.

Materials Needed--Flannel board, Pelon bales of hay, a barn.

Procedures--Use the yarn to divide the flannel board into two make believe "alfalfa fields."

1. Place an equal number of bales on the alfalfa fields and ask the child to complete the following:

Los Fardos (1, 3, 1)


b. ¿Cuál de las pilas es más alta?

c. ¿Entonces cuál de los alfalfales rindió más fardos?

2. This time place more bales on one field than on the other and ask the child to complete the activity again.

3. Follow-up Activity--Reinforce concepts of equality, more than, and less than by providing other examples and/or activities. One possibility is to ask the child to sketch alfalfa fields with bales such that one field has more bales, less bales, or an equal number of bales.
Other Activities:

The above represent but two possibilities. Many others are possible. Another concrete activity, for example, could be to determine which set contains more members—the set of boys or the set of girls in the classroom on a given day. This can be determined by pairing the boys and girls, one-to-one, as they go out to recess or to lunch.

A semi-concrete activity would be to ask the children to draw pictures of pets they have at home. After displaying their drawings on a bulletin board, the class could "guess" whether, as a group, they have more pet dogs or pet cats. After the guesses have been made the question could be resolved by asking each child to cut out his/her sketches and pair the dogs with the cats, one-to-one, until the set of dogs and/or the set of cats is exhausted.

The concept of the "not some" attribute is troublesome for some children in the concrete-operational stage of development. This can be introduced or reinforced by asking "Are there more pets that are dogs, or more pets that are not dogs?" The above procedure could then be used to resolve this question.

Most children in the given community reported that they ride a bus to and from school. Abstract or symbolic learning activities could be devised during this ride home. One possibility is to ask the children to prepare two columns for tallying the number of cars and the number of trucks
they meet on their trip home. The children should work in groups where one group consists of children riding the same bus home. The results can then be pooled class-wide and the question "Did we encounter more trucks or more cars on the way home?" can be resolved. Inferences about the number of trucks versus the number of cars in the community can be made and tested by continuing the project for a longer period of time.
Unit 2. Number-Operations

Introduction

A number is an idea, and a numeral is a symbol used to represent that idea. The first use of number that we encounter during our mathematical development is in answering the question "How many?" Operations such as addition and subtraction are defined in terms of the union of disjoint sets or set complement, respectively. That is, the sum of two numbers, n+m, is determined by joining two sets having no members in common, one having n members and the other m members. The sum is then determined by counting the number of members in the resulting union. The difference of two numbers, n-m, is determined by starting with a set having n members and taking away a subset containing m members. The difference is then found by counting the number of members in the remaining set.

Purpose of the Activity

The purpose of the activity is to provide the child with an opportunity to consider the mathematical concepts of number, and of operations.
Activity A: Recess

Discussion—This activity reinforces number and/or operation concepts, is cast in a school environment, and is written in the child's secondary language—English. The activity is also useful in helping children adjust from the recess play period to the classroom situation.

Materials Needed—None

Procedures—After recess ask the children to help you with the following:

Recess (2, 2, 2)

a. All the children who played only basketball for recess stand up and go to the front of the room. (Count and record on the blackboard).

b. All the children who played only on the "barrancos" move to the back of the room. (Count and record on the blackboard).

c. Those of you standing at the back of the room or the front of the room now join in the center of the room. (Count and record on the board).

d. Ask the following questions. How many played only basketball? How many played only on the barrancos? How many played basketball or on the barrancos?

Note: This activity can be varied by asking other questions pertinent to child activity during recess. The limitations are only in the imagination of the questioner.

An alternative set of questions, for example, could be the completion of the following, illustrating subtraction.
Recess (2, 2, 1)

a. All of you who played frozen tag come to the front of the room. (Count and record on the board).

b. All of you who were not tagged frozen move to the back of the room. (Count and record).

c. Ask the following questions. How many played frozen tag? How many were not tagged frozen? How many are still left at the front of the room? What do these children represent?

Follow-up Activities—Discuss the concepts of addition and subtraction with the children. Provide further activities if necessary; a possibility is to ask the children to devise their own situations and to present them to the class.
Activity B: Las Vacas  

Discussion—This activity also reinforces number and/or operation concepts, reflects the home environment, and is written in the child's primary language.

Materials Needed—Flannel board, Pelon cows and calfs, yarn, and Pelon numerals.

Procedures—Use the yarn to separate the flannel board into two make-believe corrals. Place $n$ cows and calfs, and $m$ cows and calfs, in each of the corrals, respectively. Ask the children to complete the following:

Las Vacas (2, 3, 1)

a. Primer estudiante: Cuenta los animales en uno de los corrales y coloca el numeral representante en el corral.

b. Segundo estudiante: Haz lo mismo con el segundo corral.

c. Tercer estudiante: Abre la puerta de los corrales y junte los animales para llevarlos al agua.

d. ¿Cuántos animales llevamos al agua? Cuéntenlos y coloquen el numeral representante afuera de los corrales.
An alternative situation, illustrating subtraction, is represented in the following:

Procedures--Use the yarn to separate the flannel board into two "corrals." Place n cows and calves on one "corral" and ask the children to complete the project card.

Las Vacas (2, 3, 1)

a. Primer estudiante: Cuenta los animales y coloca el numeral representante a un lado de los corrales.

b. Segundo estudiante: Es tiempo para herrrar los becerritos, apártalos a un corral y cierra la puerta. Cuéntalos y coloca el numeral en ese corral.

c. Tercer estudiante: Cuenta las vacas que quedan en el otro corral. Coloca el numeral en ese corral.

d. Todos juntos: ¿Cuántos animales había en los corrales? ¿Cuántos becerritos se apartaron para herrrarlos? ¿Entonces cuántos animales quedaban en el otro corral?

Follow-up Activities--Discuss the addition and subtraction concept illustrated in these activities with the children. Addition and subtraction should be introduced, at first, through various manipulations of situations such as these. Asking the children to think of other situations that the class might enjoy doing is one way of determining if the concepts have taken root. If necessary, draw upon other addition or subtraction activities until you feel the child is ready for abstract representations.
Activity C: Adobe Making  Code:  (2, 3, 2)

Discussion--This activity as identified by the coding is also for use in a number and/or operation setting, reflects the home environment, and is written in the child's secondary language--English.

Materials Needed--Water, dirt, an adobe form for n adobes, dried grass or hay.

Procedures--Ask the child to complete the following:

Adobe Making (2, 3, 2)

a. Mix dirt, water and hay.

b. Place a mixture of the above into the n slots of the adobe form. Remove once the mixture is dry and do it again.

c. Continue until you have prepared the form full m times.

d. How many adobes did you make the m times you filled the form with n adobes?

Follow-up Activity--Discuss the concept of multiplication as repeated addition. Devise other activities to reinforce the concept.
The same situation can be used to introduce and/or reinforce division. The following is only one such example, many others are possible.

Adobe Making \((2, 3, 2)\)

a. Mix dirt, water, and hay.

b. Place a mixture of the above into the \(n\) slots of the adobe form. Remove once the mixture dries and repeat the activity.

c. Continue until you have made \(m\) adobes.

d. How many times did you have to fill the form with \(n\) adobes to make \(m\) adobes?

Follow-up Activities—Discuss division as the inverse of multiplication. That is, given the product and one of the factors, determine the other factor. Provide other activities until the child feels comfortable with the division concept.
Activity D: Ristras de Chile Code: (2, 3, 1)

Discussion--This activity is for use in presenting concepts of number and/or operations, it is cast in the child's home experiences, and is written in the child's primary language--Spanish.

Materials Needed--Plastic or paper chilis, string or yarn.

Procedures--Ask n children to complete the following:

Ristras de Chile (2, 3, 2)


b. Después de acabar todos, cuenten las ristras.

c. Si ene de ustedes prepararon eme ristras cada uno, entonces cuántas ristras se hicieron entre todos?

d. Vamos a vender cada ristra por una moneda. ¿Cuántas monedas vamos a realizar por nuestro trabajo"

Follow-up Activity--Discuss and offer other examples and situations reinforcing the multiplication as repeated addition concept.
The same situation can be used to introduce or reinforce the division concept. The following is one example.

**Ristras de Chile (2, 3, 1)**

a. Aquí hay eme ristras de chile que nos han vendido nuestros vecinos. Ahora nos vamos a repartir de las ristras.

b. Uno de ustedes distribuye el chile uno a la vez a cada uno de nosotros.

c. ¿Cuántas veces nos tocó recibir una ristra? ¿Y cuántas ristras recibimos cada uno?

d. Había eme ristras, y ene de nosotros, y cada uno recibió una ristra cuántas veces?

Follow-up Activities—Discuss the concept of division with the students, provide other activities until the child learns the concept. Other situations might include piñon picking, for example.
Other Activities

The preceding represent only a handful of activities possible. Other concrete activities could include questions concerning the colors of toys a child might have at home or at his disposal at school. The number of different types of trees compared to the number of trees in an orchard, the child could be asked to classify and count the number of different types and bring his tallies to school. His parents could be asked to help the child determine the numbers.

Semi-concrete activities might include pictures of an orchard with different types of trees, or pictures of different types of animals, and questions which involve various operations that can be answered by counting "how many."

Abstract examples are illustrated in the following. Other examples are possible by using the information collected and/or observed in the child's daily life.

Exercises, Ejercicios

1. Addition, Sumar

a. Juan lives in subcommunity A. His grandmother lives in D. One morning Juan decided to chop wood for his grandmother. He saddled his horse and left for her house. On the way he decided to stop and visit with his padrino in B. He also stopped in C at the general store for a coke. The distances between these stops are:

   A to B     2 miles
   B to C     4 miles
C to D 3 miles

How far did Juan have to ride his horse to get to his grandmothers?

b. Don Dulcineo llevó sus novillos a la venta. El primero pesaba 125-libras, el segundo pesaba 154-libras, y el tercer pesaba 178-libras. ¿Cuántas libras pesaban los novillos de Don Dulcineo?

2. Subtraction, Restar

a. There are 18-children in our classroom. If 10 are girls, how many are boys? Count them and check for yourself.

b. Nuestra comunidad fue colonizada en 1751. Nuevo Méjico entró en la union de los estados en 1912. ¿Cuántos años después de la colonización de nuestra comunidad entró Nuevo Méjico en la union?

3. Multiplication, Multiplicar

a. Juanita sold 12 buckets of apples at the Farmer's Market. She received $2 per bucket for her apples. How much money did she give to her husband Juan?

b. Don Dulcineo le vendió 150-fardos a su vecino. Por cada fardo recibió 3-monedas. ¿Cuánto dinero realizó Don Dulcineo?

4. Division, Dividir

a. Juanito was helping his father make adobes for their new house. They were making 8 adobes at a time on the adobe form. How many times will they have to fill the form to make 96 adobes?

b. Don Dulcineo tenía 200 vacas y cinco hijos. En su vejez ya no podía lidiar con ellas. Decidió darle a sus hijos las vacas. ¿Cuántas vacas le dio a cada hijo, si las repartió igualmente?

These illustrations represent but a few of the many that are possible. The child's environment is rich in other child experiences the imaginative teacher can tap.
Unit 3. Geometry and Measurement

Introduction

A second use of "number" is in the measurement of objects. Looking at the objects to be measured and the measurement process itself reinforces previously learned concepts. When measuring an object linearly, for example, a unit of measure is chosen--the length is then determined by counting "how many" of the unit it would take to form an object as long as the one in question.

Geometry and measurement are useful in the elementary grades for generating interest and motivation as well as reinforcing mathematical concepts.

Purpose of the Activity

The purpose of the activity is to reinforce mathematical concepts and to present the child with situations that will motivate further understanding.
Activity A: The Geometrical Community  Code: (3, 1, 2)

Discussion--This activity reinforces geometrical concepts, is set in a community atmosphere, and is written in the child's secondary language--English.

Materials Needed--Dittoed copies of the community, pencils, rulers, and crayons.

Procedures--Hand out the above to the students and ask each child to complete the following:

The Geometrical Community (3, 1, 2)

a. Using your ruler and your pencil connect the dots from A, to the picnic area, to the peak, then back to A.

b. Now color the area between the lines red.

c. The red area in your map is called a triangular region and the border is called a triangle.

d. Make other triangular regions, but color them another color.

This activity can be varied by using more than three points. Examination of the additional regions colored by the student also helps determine the kinds of problems he may be having. That is, the cues that he took from the original activity may not have been adequate for the student to conceptualize the notion of "triangle."

A follow-up activity may also have the student connect any three non-collinear points on his map and tell the name of the points involved. The different triangular regions produced by the class should be shared to stress the different shapes triangles can have.
Activity B: La Arbolera Geometrica  Code:  (3, 3, 1)

Discussion--This activity also is to reinforce geometrical concepts, reflects elements of the home environment and is written in the child's primary language--Spanish.

Materials Needed--Pegboard, pegs, rubber bands

Procedures--Place pegs in array fashion in the pegboard. Place a red rubber band around several of the pegs to form a rectangle. Ask the child(ren) to complete the following:

La Arbolera Geometrica (3, 3, 1)

a. Don Dulcineo tiene dos hijos. Les pidió que la ayudaran a recoger las manzanas para no perderlas. Ya llegaba la nieve.

b. Al hijo mayor le pidió que recogiera de los árboles dentro la región rectangular, la cual está formada por el elástico rojo.

c. Con el elástico azul, formale al segundo hijo una región semejante pero conteniendo menos árboles.

d. Don Dulcineo va a recoger las manzanas de los árboles que quedan. ¿Le tocó al señor una región rectangular?

This activity can also be varied by using other geometrical shapes. See comments for previous project for further ideas.
Activity C: Measurement—Las Fiestas  

Code: (4, 1, 2)

Discussion—This activity as indicated by the code reflects measurement concepts, the community environment, and is written in English, the child's secondary language.

Materials Needed—Community map, yarn

Procedures—Hand out a map of the community and different colored yarns. Ask the students to complete the following:

Las Fiestas (4, 1, 2)

a. Juanito and his friends met at the fiestas, each having walked from his home. They decided that the person who walked the less distance should buy the cotton candy.

b. Juanito lives in A. Josefina lives in B and Robert lives in C. They each walked through the roads connecting the communities and did not walk over the mountains.

c. Use the red yarn to trace Juanito's path from his home to D, where the Fiestas were held. Cut the yarn. Do the same for Josefina and Robert, using green and blue yarn, respectively.

d. Compare the yarns to determine who should buy the cotton candy.

A variation of this activity would be to have the distances between points on the map printed. The child would then have to add the distances between the points from the community to the Fiestas location and compare the sums.
Activity D: La Arbolera  

Discussion--This activity also reinforces mathematical concepts through measurement, reflects activities in the home environment and is written in the child's primary language.

Materials Needed--Pegboard, pegs, yarn--pieces of equal length.

Procedures--Hand out the above and ask the child to complete the following:

La Arbolera (4, 3, 1)

a. Don Dulcineo les dio a sus hijos e hija una porción de su arbolera. A cada uno le dio deciseis metros de alambre para que acercaran sus árboles. Los árboles están situados un metro apartes.

b. El hijo mayor acercó el de él en un rectángulo tres por cinco. El hijo menor acercó el de él en un rectángulo siete por uno. La hija acercó el de ella en un rectángulo cuatro por cuatro.

c. ¿Quién realizó más árboles?

This activity can also be completed by changing the dimensions of the rectangular areas.
Other Activities

The preceding represent only a handful of activities, countless many others are possible. Concrete activities, for example, could include observing the child's house and noting the different geometrical shapes formed by the various surfaces throughout. Fields, buildings, etc., also lend themselves for use in these types of experiences. Field trips around the school or community searching for various shapes could be conducted.

Semi-concrete experiences could utilize maps, sketches, and drawings of objects seen throughout the child's living environment. These could be used for identification purposes.

Abstract activities might include asking the child to sketch objects found in his home, or community, that have a particular geometrical shape, this is to be done in the classroom.

Concrete activities involving measurement could include estimating the number of strides necessary to circumvent the school building, the house, the field, etc. The estimate should be recorded, the strides counted, and the estimation error determined. Most any concrete object lends itself to this type of activity.

Semi-concrete measurement activities could include the determination of areas, perimeters, etc., of familiar objects from scale drawings.

Abstract activities could include those which describe
verbally or in printed form a field, home, or other object in the child's environment. The child would then be asked to determine certain measures from the data given.

In summary, the activities and/or suggestions presented in this section are nowhere near representative of all the possibilities open to the classroom teacher. These are but a few examples, some of which appear in textbooks, usually in different settings. The major difference, however, is that the situations posed here are based on aspects found in the child's living environment; that is, the child living in the community reported in this section. On the other hand, most commercially prepared materials represent a much larger environment, which is also acceptable. It is not implied, nor should it be inferred, that the illustrated examples should replace the current materials, but should simply supplement them. For the old adage that "there is no panacea in education" is still true.

For further ideas and examples the classroom teacher is invited to peruse the materials in the bibliography of this chapter.
CHAPTER BIBLIOGRAPHY


CHAPTER V

SUMMARY AND RECOMMENDATIONS

Summary

The primary concerns of this study were

1. to review literature relevant to the educational needs of minority children, and

2. to develop a procedural model, based on the findings in (1) above, through which teachers of these children could provide "culturally-democratic" learning experiences.

The literature reviewed indicated that "minority group students show appreciably poorer records than Anglo students" (4, p. III). These records include reading level, grade completion, overageness, and student participation in extracurricular activities. The U.S. Commission on Civil Rights added that "an educational system that is inadequate for the minority child is a costly system for our country."

Bilingual-Bicultural education became the means by which these inadequacies were to be eliminated. This concept and philosophy gained much impetus after recent Supreme Court decisions such as the Lau v. Nichols decision in California and the Serna v. Portales in New Mexico. It was noted, however, that these same programs were, in some cases, lacking in materials that capitalized upon the child's
experience and background. It became evident that materials are needed that made the transition from home to school smoother. That is, materials that reflect the child's natural interests and immediate environment are needed. It was also noted that at present materials are produced for use by a national audience, and therefore the task of devising materials which take into account local interests and backgrounds should become the function of the classroom teacher.

To aid the teacher, additional review was conducted on the intellectual growth of the young child. Four major forces which contribute to the intellectual development of the young child became evident: schooling, environment, experience, and culture. The use of supplementary learning materials based on those forces for the purpose of bringing together the child's out-of-school environment and his in-school environment was discussed.

Further review on learning materials for use by young children was then done. Certain characteristics of such materials became of prime importance. Those included

1. Experiences that are cast in a multi-sensory format,
2. materials that guide the child from concrete to semiconcrete to abstract stimuli, this depending on the child's current level of cognitive functioning, and
3. materials that reflect the child's complete living environment, that is, the physical, the social, the linguistic and cultural environments.
A three part model, based on the findings, was developed and discussed for the purpose of guiding the classroom teacher in the development of "culture-based" materials.

The first part of the model was a flow diagram describing the overall activity. Briefly, the developer should seek to make the child's out-of-school environment and his in school experiences consistent with each other.

The second part of the model was an instrument designed to secure pertinent data relative to child-life in a given community; selected aspects of which are to be used in the devising of "culturally relevant" learning experiences.

The third part of the model was a geometric 3-dimensional configuration. The first dimension identified the concept a given activity introduces or reinforces. The second dimension identified the child-environment reflected: school, community or home. The third dimension identified the language in which the experience is written. The coding serves as a means of recording and identifying the learning experiences for future use.

The model was then illustrated as follows:

1. Cooperating teachers in three Northern New Mexico school districts were selected,

2. the teachers were responsible for collecting the data on child-life in their respective communities. For this purpose a guide for administering the child-life
inventory and letters of parental permission were written (see appendices).

3. The inventories revealed that the majority of children in these areas were bilingual in Spanish and English. Literature on teaching Mexican-American children was summarized.

4. Mathematics was chosen as the content area to be used for illustrative purposes. Some aspects of the teaching of mathematics to bilingual children were also described.

5. For illustrative purposes the elementary school mathematics curriculum was presented in three major levels: Pre-Number Concepts, Number and Operations, and Geometry and Measurement.

6. Mathematics supplementary teaching materials were then identified and reviewed for ideas and examples.

7. The information collected via the child-life inventory, and ideas inferred from (3), (4), (5), and (6) above were noted.

8. Mathematics learning experiences reflecting the data summarized in (7) above and in accordance with the concrete-to semiconcrete-to abstract continuum were presented and discussed. Suggestions for other possibilities were also provided.

In summary, it was noted that these materials were for illustrative purposes only and were not intended to replace
existing materials. Any materials devised in this fashion should be used only as a supplement to the usual curricular materials and learning experiences.

Recommendations

Based upon the activities that led to the completion of this study the following recommendations are made.

1. Bilingual-Bicultural education is a viable means for improving educational opportunities for minority group children in this country and should therefore continue as an alternative educational plan for those who choose to use it.

2. The bilingual-bicultural curriculum should be consistent with the child's level of cognition including his learning style, stage of intellectual development, out-of-school environment, experience, and other cultural ramifications.

3. In-service and pre-service teacher-training programs should include components which are designed to accomplish the following:
   a. to develop appropriate attitudes and behaviors of educational practitioners toward minority group children, (Ruiz' (3), for instance, developed training component packets designed to provide basic information relevant to the education of Mexican-American children).
b. To teach teachers to teach various content areas to minority group children, (Gallegos (2), for example, is presently developing such a program for teaching mathematics to teachers of Spanish speaking children).

c. To teach teachers to conduct ethnographic (the task of describing a given culture) field work with respect to children's culture. The child-life inventory developed and described in the present study is recommended for this purpose. This should be required early and often during the teacher training period.

d. To develop the skills necessary for "culturizing" the curriculum to specific and regional areas. The model described and illustrated in this study is recommended for the preparation of supplementary teaching materials for the purpose of attaining this goal. This should also be required early and often during the teacher training experience.

e. Components similar to Ruiz' and Gallegos' should be developed for other minority group children and in other content areas.

4. The following further research is also recommended:

a. The model developed in this study should be tested under pre-service and in-service conditions.

b. The materials developed should be tested with respect to student achievement and attitudes.
c. Additional studies and research should be supported for the purpose of improving educational opportunity for all children.

In conclusion, let us take the attitude expressed by Pope John XXIII, as quoted by Bernal (1, p. 10), when he stated

Let us not engage in interminable discussion under the pretext of seeking the better or the best, failing meanwhile to do the good that is possible and thus obligatory.

Let us then proceed to do the "good" we are capable of doing with what we now know and what we have available to us.


A MODEL FOR DEVELOPING CULTURE-BASED TEACHING MATERIALS

A Teacher's Guide

Introduction

The primary objectives of this guide are twofold. The first is to familiarize the classroom teacher with literature concerning the use of teaching-materials in a bilingual setting. The second is to equip the teacher with a procedural model through which "culturally-democratic" learning experiences could be designed.

Teaching Materials

The literature indicates that minority group students show poorer records in school than do Anglo students. These records include: reading levels, grade completion, overageness, and student participation in extracurricular activities. The U.S. Commission on Civil Rights (2, p. III) has stated that "an educational system that is inadequate for the minority child is a costly system for our country."

Bilingual-Bicultural education has become a means by which these inadequacies are to be eliminated. This concept and philosophy gained much impetus after Supreme Court decisions in California (Lau v. Nichols) and in
New Mexico (Serna v. Portales). It has been noted, however, that these same programs are, in some cases, lacking in "culturally-democratic" learning experiences, that is, experiences that capitalize upon the child's experience and background. In addition, materials that provide a smoother transition from home to school are needed. Such materials would reflect elements from the child's immediate environments (home, school, community) and natural interests. At present, however, materials are produced for use by a national audience, and therefore reflect national interests and environments. The task of devising materials which take into account local interests and local backgrounds is then a function of the local classroom teacher.

The following characteristics of learning materials for use by young children are of prime importance.

1. Experiences that are cast in a multi-sensory format.
2. Materials that guide the child from concrete to semi-concrete to abstract stimuli.
3. Materials that reflect the child's complete living environment, that is, the physical, the social, the linguistic, and the cultural environments.

In addition, developers of educational experiences for minority group children should strive to:

1. Humanize the curriculum, especially when teaching math and science concepts.
2. Personalize the curriculum: relate personal experiences
and interests of children to the curriculum.

3. Include fantasy and humor in the curriculum. Use puppets and role playing techniques.

4. Encourage cooperative group work.

5. Arrange the classroom so that it permits maximum adult and child contact. A classroom with learning centers permits some children to work alone, thus enabling the teacher to work with small groups or individually with children who need personal contact.

6. If a class is too large, implement cross-age teaching.

7. Be sensitive to the child's feelings, remembering that a child-centered rather than a task-centered approach is more effective with traditional Mexican-American children.

8. Use personalized rewards which make your relationship with the child closer: "I am proud of you," or "Now that you can read that book, we can both read it together."

9. Use as much Spanish as possible in the classroom. Try to obtain Spanish-as-a-second-language material for the children.


11. Introduce Mexican, Mexican-American, and Spanish heritage materials into the curriculum. Asking the parents' help is a good way to involve them actively in the educational process.
12. Make educational materials available to parents so they can instruct their children at home. (3).

A three part model for the purpose of directing the activities towards accomplishing the above follows in the next section.

The Model

The process model is presented and discussed in three phases:

Phase I: Flow diagrams which describe and organize the steps into a sequential order are presented via two configurations.

Phase II: An instrument for the purpose of collecting data on a child's living environment and experience is presented.

Phase III: A geometric configuration, that is, a cube, for the purpose of coding the materials is discussed.

The Flow Diagram

The diagram is presented and discussed in two parts. The first are the initial actions a developer must take; second, are the follow-up activities if the initial investigation warrants development of materials.
Figure 1.1 depicts the initial actions of the developer.

1. The developer should conduct an inventory on child-life in the given situation. The inventory is discussed and presented in the second part of the model.

2. The developer should examine the teaching materials available.

3. If the examination indicates that the materials do not reflect, adequately, child-life in the given community, then the developer should prepare materials to remedy this situation. This process is illustrated by Figure 1.2.
4. The content area for which the materials are intended must be identified. Examination of commercially prepared materials for adaptation or ideas should be conducted at this point.

5. The elements of child-life in the given community identified in (1), to be reflected on the activity, should be selected.

6. Adapt materials selected in (4) or develop new experiences which reflect those elements identified in (5).

Figure 1.2
The Child-Life Inventory

Purpose: The inventory is an instrument designed to assist classroom teachers and/or materials developers identify specific elements of the child's environment. Some of these elements will be utilized in producing culture-based teaching aids to supplement existing teaching materials. The ultimate objective being to help create a more culturally-democratic learning environment.

Procedures: Select three children from your classroom with whom you have had, or will have, the opportunity to work, play, learn, and grow during this school year. You are to study three environments in which these children function, the community, the school and the home. The outline will assist you in observing and recording systematically. It is not intended to be all inclusive but, is merely to provide you with examples of what might be observed. Do not hesitate to include descriptions which might be useful in identifying the community, home, or school, and are not called for specifically.

Try to solicit as much of the information as possible from the children. However, do not limit your description of the environments to those elements they volunteered but be sure to include them in your report. One technique which is often used in interviewing is to ask grand tour questions. For example, "Would you show me around your
play yard?" As the child moves from place to place he might name places and things you might have overlooked. Or, he might mention activities that might take place in these areas. These are clues as to how he functions in this environment. Not all grand tour questions involve movement. As an example, "What do you do on Saturdays? Begin with the moment you get up and tell me all that you might do, who you might see, and so on until you go to bed at night."

Structural questions are also used to set up taxonomies. These questions usually begin with "What are all the different ways of ...?", or What are all the different types of...?" Some specific examples might include, What are all the different games you play when you are alone? With others?", or, "What are all the different ways you help your mother and father?"

A taxonomy is a structure which is often used to represent a set of elements which are related by some parameter. The taxonomy should assist you in organizing and recording your impressions across situations. Prepare as many as you think are necessary during your field work.

The final step is to write up the ethnographic account. You have listened, observed, participated, and recorded data from a child's environment. At this stage you are ready to write up a descriptive account. However, when writing up the report always keep in mind that you have studied a
child's environment. Instead of asking yourself "What did I see in their environment?", ask yourself, "What might these children see in their environment of people and places and things?"

The specific elements of the inventory follow:

I. The Community

A. Setting

1. In what type(s) of physical environment(s) is the community located?
   a. forest
   b. desert
   c. mountains and valleys
   d. plains
   e. other, specify

2. What is the settlement pattern?
   a. dispersed homesteads
   b. compact villages
   c. town or city
   d. other, specify

3. What are some of the major subcommunities?

4. What are some of the bodies of water, parks, other points of interest, or distinguishing features?

5. Rough sketch a map indicating the above.

B. Population

1. What is the population number?

2. What is the ethnic composition?

3. What are the subsistence technologies?
   a. farming and/or ranching
   b. migrant, specify
   c. governmental, specify
   d. industrial, specify
   e. commercial, specify
f. other, specify

4. What activities are practiced which do or which might include the child?
   a. social
   b. cultural
   c. subsistence
   d. other, specify

5. What languages are used for communication?

6. Specify any other potentially useful conditions not asked for above.

II. The School

A. Setting
   1. Describe the area surrounding the school. List what might be seen from the middle of the school grounds.
   2. List the grade levels and the number of classrooms per level in this school.
   3. Specify other pertinent conditions not called for above.

B. Population
   1. What is the school enrollment?
   2. What is the ethnic composition?
   3. What languages are used for communication?
   4. What play activities are practiced during recess, lunch, etc.?
   5. What is the child's grade level?
   6. How many adults are assigned to this class? Specify their roles.
   7. How many children are assigned to this classroom? Specify the number of boys and number of girls.
   8. What languages are spoken by the children in this classroom?
9. What is the ethnic composition?

10. Specify other pertinent conditions not asked for above.

III. The Home

A. Setting

1. In which subcommunity does the child live?

2. What is the immediate environment?
   a. plant life
   b. animal life
   c. fences
   d. corrals
   e. commercial area
   f. residential area
   g. rural area
   h. other, specify

3. Specify other pertinent conditions not called for above.

B. Family

1. Specify the number of adults and their kinship to the child.

2. Specify the number of boys and of girls and their kinship to the child.

3. Specify the subsistence technology or technologies.

4. Describe the child's activities or actions.
   a. at work
   b. at play, alone or with others
   c. other, specify

5. Describe any other pertinent conditions not listed above.

The inventory is only an outline intended to facilitate the collection of data. The investigator is free to choose any other instrument for this purpose.
The Coding

The third part of the model consists of a procedure for systematically developing, coding, and filing culture-based teaching materials. Concept, environment, and language are three parameters by which any culture-based material can be categorized. In other words, all such materials are designed to teach some concept, are cast in some physical environmental setting, and are written in some language. A three dimensional configuration and its ordered triple description is therefore suggested for this purpose. (See Figure below).
Teaching materials coded (2, 3, 1), for instance, are useful in teaching the concept identified by row 2, are cast in a community setting, and are written in the child's dominant language. (See cell X). On the other hand, material coded (1, 2, 3) is to be used in teaching the concept specified by row 1, is cast in the child's home environment, and is written in the child's vernacular language. (See cell Y).

In summary, teachers must prescribe suitable learning activities at any given moment. The coding and the configuration facilitate the identification of teaching-materials reflecting specific elements of the parameters mentioned earlier: concept, environment, language. The coding scheme, i.e., the cube, should therefore, be in a convenient location for quick reference by the user. In addition, the culture-based materials should also be filed according to this scheme. That is, by rows, then columns, then layers.

Let us take the attitude expressed by Ausubel (1, p. 6) when he stated

If I had to reduce all of educational psychology to just one principle, I would say this: the most important single factor influencing learning is what the learner already knows. Ascertain this and teach him accordingly.

Let us then proceed to devise materials which take into account "what the learner already knows," that is, his experience in his world of people and places and things.
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May, 1977

Dear Parents:

To provide better teaching materials for children in your schools, your child's teacher is helping me collect information about child-life in your community. From this information we collect, we will write up teaching materials reflecting child-life in your area. These materials will be used in teaching your child mathematics, and will also help your son or daughter's teacher develop similar materials in other subject areas.

I am an Assistant Professor of Mathematics at New Mexico Highlands University, and I am working with teachers in communities such as this one.

Please sign below if you have no objections to this information being collected and used for these purposes.

Sincerely,

Gilbert D. Rivera
Asst. Prof. of Mathematics

Parent's Signature
Queridos Padres:

Para mejorar los materiales de instrucción que usan los niños en las escuelas, el maestro de su hijo o hija me está ayudando juntar información tocante la vida diaria de los niños en su comunidad. Con esta información vamos a escribir materiales que reflejan la vida de los niños en su área. Estos materiales se van a usar en la enseñanza de matemática, y también le ayudarán al maestro a escribir materiales semejantes para los otros estudios.

Soy profesor de matemática en New Mexico Highlands University, y estoy cooperando con maestros en comunidades como éstas.

Si usted no está opuesto a la colección y el uso de esta información, por favor firme este formulario de permiso.

Sinceramente,

Gilbert D. Rivera
Profesor de matemática

Firma del padre o de la madre
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