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A radio quiz strategy for non-formal education.

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A RADIO QUIZ STRATEGY FOR NON-FORMAL EDUCATION

A Dissertation Presented

by

James Marshall Theroux

Submitted to the Graduate School of the
University of Massachusetts in
partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

August, 1974

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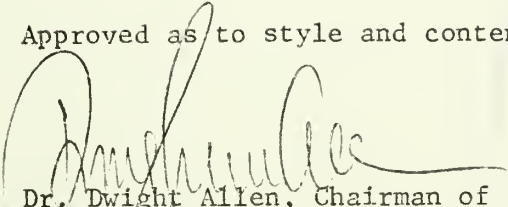
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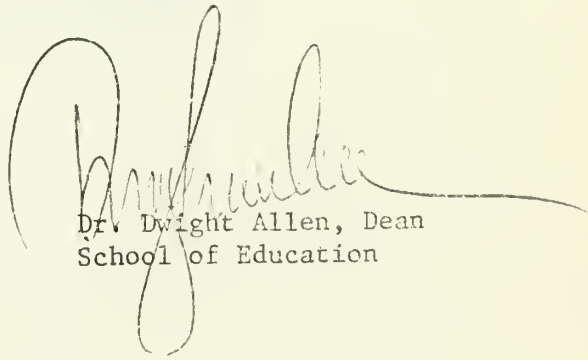
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August 1974

HOME-BASED EDUCATION
A RADIO QUIZ STRATEGY FOR NON-FORMAL EDUCATION
(AUGUST, 1974)

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ABSTRACT

During the past eight years, home-based education has gained international attention, largely due to several major curriculum development projects in this country. Two assumptions underlie systematic attempts to train parents to be more effective educators of their children: first, that the early years are critical to a child's later cognitive functioning; second, that parental influence to a large extent determines the child's development, especially during the pre-school years. To substantiate the first assumption, work of Piaget, Freud and Hull are considered. Empirical evidence from both human and animal studies corroborates their theoretical formulations.

A wide range of studies support the second assumption--that parents play a critical role in the development of children. Studies which either compare monozygotic twins or institutional and non-institutional children indicate the magnitude of parental impact.

Other investigations show that (1) optimal "parenting" patterns can be identified through research, and (2) aspects of these optimum patterns are found among parents of all socioeconomic strata.

The special relevance that these facts may have for developing countries are presented in the context of three common problems: illiteracy, wastage and lack of education among women. A case is made based on theory and research for establishing a home-based alternative for children younger than nine years old.

The nature of such an alternative could be based on the extensive experience of home-based programs both here and abroad. The range of possibilities are outlined in terms of objectives, delivery systems, curricula and training methods.

Finally, the radio quiz show, a new and inexpensive way of delivering useful information to parents, is tested. The program designed and produced by the author was compared to a taped lecture which communicated the same information. One hundred twenty (120) university students were randomly assigned to sub-groups--one which listened to the quiz show, a second which listened to the taped lecture, and a third which took a test on the content of the two presentations but which received no instruction. Comparisons of the three groups revealed that the quiz show subjects were superior on the paper-and-pencil test, scoring 90%. The lecture group scored 80% and the control group 57%. These differences are significant at the .001 level.

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I N T R O D U C T I O N

Nations, rich and poor, are seeking ways to meet educational needs at low cost. To do this we must either tap new human or material resources, or redefine traditional roles. During the past decade, several educators have begun to explore the family's potential for self-education. Capitalizing on family strengths (e.g., concern, loyalty) and systematically utilizing the learning through teaching principle in the home context, may provide sorely needed answers to nations with relatively small resources for education.

Current notions notwithstanding, the family remains the prime socializing agent, particularly in less urbanized countries (Bronfenbrenner, 1970). Even in the United States, where family influence seems to be declining, studies indicate that family characteristics--not class, race or quality of formal education--are the best predictors of a child's intellectual achievement (Wolf, 1964).

However, even assuming that parents universally desire to provide the best care (including education) for their children (Phillips, 1970), certain questions arise. On what scientific basis do we recommend more systematic parental involvement in the educational process? What are some of the ways (i.e., materials, training procedures, etc.) in which this might be accomplished?

What special relevance might home-based education have for developing countries? Finally, what new methods might we suggest for reaching large numbers of families?

The present work will provide answers to these questions. More specifically, the dissertation has the following objectives:

- (1) Identification of the research and theory on which the rationale for home-based education is founded;
- (2) Analysis and review of the programs which have systematically tried to assist adults in their role as parents;
- (3) Discussion of the special relevance of family education in developing countries; and
- (4) The creation and testing of a new method for reaching large numbers of rural families.

A single chapter is devoted to each of these objectives.

CHAPTER I

THE SCIENTIFIC BASIS FOR HOME-BASED EDUCATION

Two trends in child study have spawned family development programs (Gordon, 1968) in this country. The first concerns a growing awareness of the importance of early childhood experience for later cognitive functioning. The second reflects the long held view that parents strongly influence their children's cognitive and affective growth. Since these two notions constitute the foundation of any home-based education program, they will be explored and substantiated in this chapter.

Importance of Early Experience

Theories of two general sorts, developmental and learning, point to the critical significance of early experience for later growth and functioning. Developmental theory including Hebb's neuropsychological formulation, Freud's psychoanalytic work, and Piaget's cognitive studies, will be considered first, followed by a brief summary of Hull's theory of learning with emphasis on aspects relevant to the above topic.

Developmental Theory and Early Experience

D. O. Hebb, a neurophysiologist, used his knowledge of brain functioning to build a theory which explains human thought or

"information processing" (Hebb, 1949). He observed that whereas infantile cerebral brain lesions usually result in severe retardation, removal of twenty percent of cerebral tissue in adults does not seem to cause diminished performance on standard intelligence tests. This observation led him to distinguish between what he termed "primary" and "later" learning (Hebb, 1949).

The distinction can be understood through the concept of "cell assemblies" which link together to form "phase sequences." Hebb described the neural cell assemblies as relatively fixed functional units which require sensory input for their formation. Particular cell assemblies, once fixed or established through repeated stimulation and subsequent reduction of synaptic resistance, become the receptors for particular kinds of stimuli (Hebb, 1959). When cell assemblies connect in sequences ("phase sequences"), the organism begins to be able to process higher-order stimuli (information).

Neither the cell assemblies nor the phase sequences are conceived to be limited to one point or neuron. Rather, they represent processes which are diffused spatially throughout the brain to ever greater degrees as the organism matures. This diffusion explains why brain lesions cause relatively more damage to infants than adults.

Primary learning is then conceived in terms of perceptual experience and the building-up of cell assemblies. Since higher-order operations depend on phase sequences which are based on cell assemblies, the importance of early experience for later growth and development can be readily seen.

While taking a very different approach than Hebb, Jean Piaget arrives at some similar conclusions (Hunt, 1961, p. 357). Aspects of his work relevant to the significance of early experience will now be considered.

For Piaget the interaction between organism and environment involves two complementary processes which he terms accommodation and assimilation. These processes roughly correspond to inner organization or incorporation (assimilation) and outer adaptation or coping (accommodation). As the organism confronts new stimuli which it assimilates into ever-evolving "internal structures" or "schemata" (Furth, 1970) and then accommodates those schemata when dealing with novel situations, it becomes capable of absorbing and manipulating stimuli that are progressively more removed from it in time and space ("higher levels of abstraction"). Piaget defines this growth process according to a series of age-related stages in which each stage becomes incorporated and reorganized in subsequent stages.

Hunt (1961, p. 258) lists four Piagetian hypotheses that provide some theoretical support particularly related to the significance of early experience. First, "appropriate stimulation and opportunity to exercise schemata" are necessary to maintain the existence of reflexive and acquired schemata. Disuse leads to atrophy. Second, the organism receives intrinsic reinforcement ("function pleasure") when schemata are accommodated and new stimuli become assimilated. Third, the rate of development is substantially determined by

environmental conditions. A corollary to this principle is that the more the organism differentiates and develops his internal structures, the more he is interested in continuing to do so. Further, "the more variation in reality with which it has coped, the greater the capacity for coping." Fourth, maximum growth will occur when a match exists between the organism's internal schemata (its ability to assimilate at a given time) and the given stimulation.

These hypotheses clearly indicate that later functioning is directly related to the experience base developed during the earliest years. However, while empirical evidence has confirmed that the rates of growth can be influenced by variations in the environment (Dennis, 1960), more research is needed before we can conclude that the effects of early stimulus deprivation are permanent. The evidence related to this last issue will be reviewed in a later section.

Taking an approach radically different from those of Piaget or Hebb, Sigmund Freud postulates a direct relationship between childhood experience (particularly trauma) and adult emotional states. His psychoanalytic theory is based on a series of developmental stages in which id, ego and superego (psychoanalytic personality constructs) develop and interact.

The etiology of neuroses in Freud's theory provides one example which demonstrates the importance of early experience on later behavior. Freud postulates libidinal energies which are attracted to certain objects. Traumatic experiences during childhood may cause

the child to fixate on one or more of these objects. Later in life, this can lead to neuroses when the individual "regresses" to a desire for the fixated objects and is confronted with "frustration" at not being able to legitimately satisfy libidinal desires associated with that object (Freud, 1952, p. 355).

Although the developmental theories of Hebb, Piaget, and Freud differ markedly in their approach and assumptions, it is interesting to note that each points to the key role played by early experience in the development process. While other developmental theorists such as Erickson, Havighurst, and Gesell could have been mentioned, we will now consider the contribution of learning theory to our understanding of the importance of early childhood experience.

Learning Theory and Early Experience

Since Hull's (1943) learning theory is central to much of the investigation in the field, it will serve our purpose to briefly outline some of his basic principles and consider their implications for the present topic.

Hull conceived the tendency for a given response (R) to occur to be a function of the "excitatory tendency" (E). The excitatory tendency is equivalent to the effects of prior learning, termed "habit" (H), the drive (D) condition (an inner motivational state), minus the amount of inhibition (I). In notation, the formulas might appear as follows: $R=S(E)$, $E=HxD-I$. While Hull defines in some

detail the conditions which influence each of the various factors in this short-hand equation, we will focus on the notion of habit since it has particular relevance to our discussion.

Habit strength is considered to be a function of (1) the delay of reinforcement following response occurrence, (2) the time interval between stimulus and response on practice trials, (3) the amount of need-reduction occurring following a response, and (4) the number of training trials (Estes, 1970). Once a habit (an association between stimulus and response) has been formed and strengthened, it is assumed to generalize to other similar stimuli. There are several important implications of these ideas for the significance of early learning.

First, since habit is a function of the number of trials, the earliest learned behavior patterns will have the most opportunity for reinforcement and therefore will be the most difficult to change or extinguish (Miller and Dollard, 1950).

Second, McLelland, et. al. (1953) postulate a kind of need-reduction (condition three above) which occurs upon successful completion of a task. These investigators show that a sequence of successes on progressively more difficult problems, along with subsequent external reinforcement, establishes a habit (in Hull's terminology) in which the generalized response to new problems is a positive one. So from the earliest years, children are predisposed to either approach or avoid new experiences.

Finally, Estes (1970) identifies the "stimulus scanning" habit

to be vital to productive learning. If a child responds too quickly (i.e., before internally scanning alternative solutions or responses) to a problem (stimulus), he is more likely to choose a non-rewarded answer the child learns that attempts at problem-solving should be avoided because they are frustrating and do not lead to satisfaction. Estes explains that the stimulus-scanning habit itself might best be learned through tasks of appropriately graded difficulty. The important point here is that absence of one type of habit (stimulus scanning) early in life can lead to the formation of other habits which preclude later learning.

To summarize, learning theory corroborates the conclusions derived from developmental theory. While only a portion of the research studies have tested particular theories, we will now review empirical evidence, both physiological and behavioral, which demonstrates the importance of early experience.

Physiological Evidence of the Importance of Early Childhood Experience

The evidence presented in this section is representative of a growing body of literature, predominantly pertaining to animal studies, which shows permanent physiological changes resulting from early experience. Here, studies of stimulus and nutritional deprivation will be considered.

Bennett, et. al. raised rats (littermates) in these conditions:

(1) isolation (no signs, objects or other rats in the cage), (2) social rearing (had cagemates but no toys or other stimulating objects), and (3) complex environment (the rats were handled, had cagemates, toys, etc.). Rats raised in the third (enriched) environment showed (1) neurochemical changes (increased acetylcholine activity) thought to be related to learning, (2) increased quantity of enriched tissue in specific areas known to be related to the kind of enriched sensory stimulation provided in the experiment (e.g., the section of the brain related to visual stimulation, the occipital cortex, was more highly developed), and (3) shifts in the distribution of neuroenzymatic activity. Bennett and his colleagues conclude (p. 618) that the measured changes, though small in absolute value, indicate that "the brain is responsive to environmental pressure--a fact demanded by physiological theories of learning and memory."

Levine (1967) raised rats which were not handled in infancy (1 to 20 days). When these rats became mothers, their offspring showed significantly less reduction of adreno-cortical steroids (a sign of decreased emotional arousal) when exposed to novel stimuli (a two-meter "open field") than pups reared by mothers who had been handled. On the basis of his other studies, Levine concludes (p. 260) that "maternal stress . . . during nursing significantly affects neuroendocrine maturation and later behavior."

An excellent selection of nutritional-deprivation studies have been collected in Scrimshaw and Gordon's (1967) edited volume.

Several will be cited here to show the physiological effects of a common early-childhood experience--malnutrition.

Dobbing reports on his extensive work with pigs and rats (Dobbing, 1964, 1968). In separate studies he subjected both kinds of animals to varying degrees of nutritional deprivation during different developmental periods. In one experiment, a group of pigs was severely undernourished during the first year of life. After a three-year "rehabilitation" period during which they were well-fed, the animals showed significantly less brain weight, myelination, and neural cholesterol concentration than a normal control group. Experiments with rats yielded similar findings with the additional discovery that undernutrition appears to have greatest effects during periods of most rapid brain growth.

Although nutritional studies of human populations are inevitably confounded by concomitant social factors, research by Cravioto (in Scrimshaw and Gordon, p. 252), Mockenberg (p. 269), and Stoch and Smythe (p. 278) seems to corroborate findings from animal studies. Cravioto, after using statistical controls for family income, housing conditions, personal hygienic conditions, and parent's education, concluded that malnutrition was the primary factor resulting in diminished body size and intersensory integration scores. Mockenberg found that although body weight returned to normal after proper nourishment was provided, brain damage persisted as a result of infantile undernourishment. Smythe discovered below-normal height,

head circumference, and alpha wave index among eleven-year-old South African children who had been severely undernourished during infancy.

Behavioral Evidence Demonstrating the Importance of Early Experience

While reviewing the behavioral evidence supporting the argument of the crucial significance of early experience, the term "critical periods" will appear frequently. Observed first in the biological sciences, critical periods usually refer to either the commonsense notion of differentiated effects of identical stimuli at different ages in the life of an organism, or (and this is the definition being used here) to a more restricted notion that there are "certain limited time periods in development during which a particular class of stimuli will have particularly profound effects and that the same stimuli before or after this interval will have little, if any, effect on the developing organism" (Denenberg, 1964). If critical periods exist for the development of various human characteristics, knowing what they are will guide our decision-making regarding experiences we provide children. Before considering permanent effects of early experience in humans, however, we will turn first to relevant animal studies.

Animal Studies

Scott (1962) and Scott and Fuller (1965) marshal a wealth of evidence to support the critical-period hypothesis in animals. We

will consider some of the studies they review and several others that have been done since.

Wolf (1943) deprived one group of rats of hearing and another group of vision for a ten to fifteen-day period during infancy. After this period of deprivation, the rats were raised in a normal way. When they reached maturity, he placed sex-matched littermates in competition for food. In the first condition, a visual cue was the basis for acquiring food; in the second, an auditory signal was used. Significantly, the animals who had been deprived of infantile auditory stimulation won (received the food) more often on the visually-based trials. The converse was also true.

Hebb (1949) compared performance of rats reared at home (enriched environment) as pets with laboratory-reared rats on the Hebb-Williams "intelligence test" (Hebb and Williams, 1946). The home-reared pups performed significantly better on initial test trials. To test whether these differences were due to such factors as tameness, rapport with the experimenter, etc., Hebb trained both groups for ten days and then ran test trials for eleven days after training. He assumed that if differences were not permanent, then the laboratory-raised group would at least improve their relative standing. In fact, the reverse occurred and Hebb concluded that "this means that the richer experience of the pet group during development made them better able to profit by new experience at maturity--one of the characteristics of 'the intelligent human being'" (Hebb, 1949, p. 299).

Thompson and Heron (1954) raised dogs (littermates) from weaning to age eight months in different experimental conditions. One pup from each pair was raised as a pet at home (enriched environment). The remaining pups were raised in three degrees of deprivation, including (1) total isolation, (2) covered cage with a cagemate, and (3) open cages with mates. Differences in problem-solving behavior on tests administered at age eighteen months were measured. Home-reared animals performed better on all tests and showed far greater ability to extinguish habits when new information was presented. Significantly, the dogs were tested after more than half a year of shared experience (deprivation ended at age eight months), indicating permanent deficits incurred during early experience.

These studies by Hebb, Thompson and Heron, and Wolf indicate that early experience can permanently affect later behavior. They also seem to imply that all stimulus "deprivation" is necessarily debilitating. Studies by Forgays and Forgays (1952) and Forgus (1955), however, support the former conclusion but deny the latter.

Forgays and Forgays (1952) raised one group of rats in open cages ("enriched" environment) and another in small, boarded cages where the rats never had an opportunity to see anything beyond ten inches from their eyes. By slightly modifying a maze, the experimenters devised a test which put relatively less premium on visual distance cues. This presumably would increase the likelihood of equal performance by "enriched" and "deprived" rats. In fact, the

"deprived" group outperformed the "enriched" group by making one-third as many errors on the maze test.

Forgus (1955) in a series of experiments found that when animals were selectively deprived (i.e., restricted in either visual, motor, tactile, etc., experience), they suffered only in ways directly related to the deprivation. For example, on test mazes which did not require special visual cues for success, animals performed relatively poorly who were raised in small cages which did not allow normal motor activity but which had clear walls that allowed for normal visual experience. When the maze required visual discriminations for navigating the maze, the "small-cage normal-vision" group did as well as the large-cage normal-vision group.

Harlow's extensive work with rhesus monkeys provides another source of evidence regarding permanent effects of early experience. He raised the animals from birth with surrogate mothers made either of cloth or wire. The artificially mothered monkeys developed abnormal patterns of sexual behavior which improved significantly when they were placed in a zoo with large numbers of normal (mothered) monkeys (Harlow, 1962). Although the sexual behavior of the non-mothered monkeys gained normalcy, the animals, upon becoming mothers themselves, showed a lack of maternal feeling or behavior toward their babies.

The final and probably clearest example of a critical period was first observed and named in the 1930's by an Austrian zoologist,

Konrad Lorenz. Lorenz noted that newly hatched goslings would follow him rather than their mother if they happened to see him first (Hess, 1972). He called the process Praguing, which in English is known as "imprinting." Although Lorenz did not consider the phenomenon to be learned behavior, many investigators have since studied imprinting as a form of learning.

Most studies of imprinting have been conducted in laboratories and demonstrate that early experience (being exposed to an object) can have permanent effects (attachment to that object). If the animals (usually birds) are not exposed to an object during a certain "critical period" they will not manifest the attachment behavior when exposed later. Although several laboratory studies have provided contradictory evidence, Hess (1972) explains that the unnatural (laboratory) setting produces confounding effects.

Although debate rages regarding the degree to which findings from animal studies generalize to human populations, it seems clear that the evidence cited confirms and amplifies the findings of the human studies which will now be considered.

Human Studies

While we know more about the early learning of experimental animals than we do of infants, a number of investigators have provided a not inconsequential amount of evidence on human subjects. After summarizing the work of Bloom (1964), we will consider more recent studies that bear on the present topic.

Bloom's (1964) extensive review and interpretation of longitudinal studies attempted to determine the degree to which human characteristics have or have not stabilized at various ages. This work, probably more than any other, confirms the hypothesis of differential growth rates of human characteristics. In regard to intellectual ability, he writes:

"By about age four, 50 percent of the variation in intelligence at age seventeen is accounted for, (and) . . . in terms of intelligence measured at age seventeen, from conception to age four, the individual develops 50 percent of his mature intelligence; from ages eight to seventeen the remaining 20 percent . . . we would expect the variations in the environments to have relatively little effect on the IQ after age eight, but we would expect such variations to have marked effect on the IQ before that age, with the greatest effect likely to take place between the ages of about one to five." (Bloom, 1964, p. 68)

Some of the key studies which led Bloom to this and other conclusions were conducted by Bayley (1949), Lee (1951), Kirk (1958) and Kagan and Moss (1962).

Bayley compiled data from the Berkeley Growth Study, a project which measured general intelligence from infancy to young adulthood. Although five kinds of intelligence tests were administered, Bloom analyzes the Stanford-Binet IQ data only. He found that measured intelligence at age two years had a correlation of .41 with intelligence measured at age seventeen. By age four the correlation increased to .71 and by age eleven it reached .92. Bloom graphs the data to show the dramatic early rise of intelligence, which slows down gradually after age eight and levels at age seventeen.

In the Kirk (1958) study, a group of institutionalized mentally retarded children were given a one-year enrichment experience at age four or five to stimulate their learning. They, along with a contrast group (no treatment) were tested before and after the enrichment experience and again several years later. Both groups continued to live in the institution following the treatment. The experimental group not only improved after the one year enrichment experience, but also continued to make gains after returning to the standard institutional way of life. In the meantime, the contrast group generally decreased in measured intelligence.

Lee (1951) studied groups of children who moved at different ages from the South to Philadelphia. Children born in the South who moved by age six gained an average of six and a half IQ points from grades one to nine. Children who moved by grade four gained three IQ points from grades four to nine. Children, who moved later made even smaller gains. Although the differences are small (due possibly to the fact that the differences in intellectual environment between the two areas are small), it is interesting to see that the amount of change effected by the environment decreased with age. This data tends to confirm Bloom's hypothesis that any given human characteristic is most subject to environmental influence during that characteristic's period of most rapid growth.

Kagan and Moss (1962) report findings of the massive Fels study which followed eighty-nine middle-class subjects for over thirty years

starting from birth. It concentrated on measuring personality variables. The investigators found several characteristics which seem to stabilize in the early years. For example, the degree of passivity and aggressiveness for males measured during the period from birth to three years was highly predictive of passivity and aggressiveness in adulthood. Further, the authors discovered several instances of what they term "the sleeper effect." For example, maternal protection (over-protectiveness) and hostility toward daughters during the birth-to-age-three period was a better predictor of adult withdrawal from anxiety-arousing situations than was the same treatment during the four-to-ten-year age period. In brief, the Fels study shows that affective as well as cognitive traits are formed and stabilized during the early years.

Before moving on to more recent work, we should mention that Bloom himself states that the evidence he collected is indicative, not conclusive; he feels that unless more accurate and comprehensive measures of the environment are developed and used, the differential growth rate hypothesis will have to remain an inference drawn from theory and relatively imprecise empirical studies.

Studies by Ainsworth (1969) and Bowlby (1969) of the importance of attachment for the child's total cognitive and emotional development bring fresh insight to our understanding of the critical nature of early experience. Attachment, as conceived by these authors, is formed primarily through certain amounts and kinds of emotional

interaction between attachment figure (typically the mother) and child. It is usually formed by the end of the child's first year of life, and can be established between several attachment figures (although one usually is clearly the strongest). It seems that infants who have a strong principal attachment later become attached to a greater number of adults than infants who have weaker principal attachments. Further, there is a correlation between weak attachment bonds during infancy and socio-emotional maladjustment later in life.

Researchers do not yet have definitive evidence demonstrating a critical period for attachment bond formation. The importance of establishing such bonds, however, has been well documented. Proximity to an attachment figure encourages exploratory behavior (Ainsworth and Bell, 1970). Learning through modeling and social reinforcement is increased as a function of the child's emotional attachment to the model or reinforcer (Bronfenbrenner, 1970). Clearly, early attachment experience can have significant influence on later learning.

Another important contribution to our understanding of critical periods in humans derives from Lenneberg's (1969) bio-developmental studies. Through evaluating neurophysiological data and training efforts with retarded and/or handicapped children, Lenneberg concludes that language acquisition becomes severely impeded after age twelve. This age coincides with the physical maturation of the brain. Lenneberg also reports that children who lose their hearing at age three or four become nearly as retarded in language development as congenitally deaf children.

A final item of corroborative evidence is supplied by Goldfarb (1943) who matched forty-five pairs of orphanage children for age, sex, educational level of biological parents, and social class of foster parents. Each of the children was separated from their mother at about age six months. At this point, one child in each pair was moved to an orphanage and the other to a foster home. The former group stayed in the orphanage to age three and a half at which time they also began living in a foster home. Hence the treatment variable in this experiment was a three-year institutional (deprivation) experience during the first years of life. Goldfarb administered several types of tests seven to ten years after both groups had been living in foster homes (enriched environment). Measured IQ of the institutional group was twenty-three points lower; further, social maturity scores, incidence of problem behavior, task compilation ability, and imagination differed significantly in favor of the non-orphanage group. To the extent that Goldfarb successfully controlled for factors other than the early experience, his data strongly suggest that early learning can have a critical bearing on later functioning.

Summary

Theory and evidence indicate that the early years are formative; yet contradictory evidence (e.g., Denenberg, 1964; Dennis, 1960) exists. It seems that limitations in research methodology and

measurement coupled with the extreme complexity of human behavior force us to accept the present data only tentatively.

A balanced conclusion might be that although the early years are important, change and growth can occur later in life as well. Accepting the critical period hypothesis in its narrow sense seems unduly pessimistic given current knowledge.

Essentially, the foregoing discussion has underlined the critical significance of early experience for later growth and functioning. Further, it appears that cognitive abilities can be modified by variations in the environment. The next section will discuss how a particular class of environmental variables--family influence--can foster optimum growth.

Parental Influence

Not surprisingly, mothers consider themselves to be the most important influence in their children's lives (Bell, 1967). Correspondingly, high school students rate their parents as the most influential factor in their academic performance and personality development (Larson, 1971). Schaefer (1972) helps to explain this phenomena by outlining major characteristics of the parents' interactions with the child:

- (1) Priority -- Parents are the first educators.
- (2) Duration -- Usually from birth to maturity.
- (3) Continuity -- Usually not interrupted, especially during early childhood.

- (4) Amount -- Greater than with other adults, especially on a one-to-one basis.
- (5) Extensivity -- More different situations and experiences shared than with other adults.
- (6) Intensity -- Whether hostile or loving, the degree of emotional involvement is usually great.
- (7) Pervasiveness -- Parents potentially influence the child's social relationships and his exposure to social institutions and professions.
- (8) Responsibility -- Most societies recognize the parents' prime responsibility for the child.

While the great impact that parents have on the development of their children has long been accepted (Schneiderman, 1968), the precise effect of particular North American parental attitudes and behaviors has only recently begun to be investigated. For the reason given below, however, a catalog of those effects, even if available, would not be relevant here.

Since the same parental behavior may have different effects in different cultures (Ballantine and Levine, 1971), home-based programs must be adapted to each unique cultural setting. The predominantly North American data presented here will be used only to substantiate certain assumptions which we feel hold true across cultures. These assumptions, around which this section is organized, are as follows:

- A. The quality of family environment can make a significant, measurable difference in the child's cognitive functioning (Impact Assumption).
- B. Within a given cultural context the behavioral sciences can begin to identify these parent-child interaction patterns which effect optimal development (Researchability Assumption).
- C. Family characteristics, not class, or race, determine a child's performance (Class-Independent Assumption).

Impact Assumption

The quality of family environment can make a significant, measurable difference in the child's cognitive functioning (impact assumption). Evidence to substantiate this assumption is drawn from two sources: (1) studies of children raised in institutions, and (2) studies of twins reared apart. While the former deal primarily with the average family's power to stimulate the child's cognitive development, the latter explore the range of effects that different family environments can produce.

Institutional Children

Spitz (1945) compared Hetzer-Wolfe developmental quotient (DQ) scores of infants raised in two different institutions. In the first (the "Foundling Home" group), sixty-one babies received very little

attention (the mothers never visited) after weaning at age three months. The mothers of this group were all socially well-adjusted; their children were placed in the institution for purely financial reasons. The other group, however, were children of delinquent minors whom Spitz described (p. 60) as either "feebleminded, physically defective, psychopathic, or criminal." The sixty-nine babies of this latter group were kept in a nursery attached to the penal home in which their mothers were confined. Each day they were permitted time to care for and play with their children.

The initial measurements at age three months yielded expected results. The babies of the normal "Foundling Home" mothers had significantly higher developmental quotients (131 vs. 97) than did the delinquent mothers' babies. During the succeeding months, however, the "Foundling Home" group, unmothered after age three months, progressively declined to a level of 72 at age one year, while the nursery ("delinquent mother") group scores rose to a mean of 105.

This study gained wide attention not only because it demonstrated the effects of "mothering," but also because it suggested that intelligence may not be fixed. Its conclusions, however, must be accepted with caution because of the difficulty in obtaining reliable test scores.

Clarke and Clarke (1959) studied children on the other end of the childhood age spectrum. They found that adolescents living in extremely adverse home environments made IQ gains averaging fifteen

points during the six-year period after they had moved to an improved family or institutional setting.

H. Schaefer (1966) investigated the effects of temporary maternal deprivation on two groups of institutionalized infants. Within the same institution, one group received considerably more care and attention; the other group could therefore be considered deprived. The stimulated group showed significant developmental (DQ) gains. The deprived group made no gains. When both groups were taken to a home environment, the stimulated group scores remained constant, while most of the deprived group rapidly rose to a level comparable to that of the other group. Those who did not raise their scores were found to be relatively less active ("constitutionally inactive"), suggesting that the child's constitutional make-up may place limitations on the family's power to foster normal growth.

During the past four decades, Harold Skeels (reported in E. Schaefer, 1972) and his colleagues at the University of Iowa conducted a series of research studies of institutional infants and children. In the "Orphanage Preschool Project" (Skeel, et. al., 1938), forty-six children living in an orphanage received a five to six hour daily nursery school experience over a three-year period. Their IQ scores were compared to those of a control group who also lived in the orphanage. Attempts were made to match the two groups for chronological age, initial mental age, and previous stay in the institution. The investigators reported IQ gains for the nursery

group and losses for the control group, and further, that, "at most ages the orphanage children had a vocabulary one fourth to one half that of the Iowa City children of average intelligence and the same age." While the nursery group scored the highest among the orphanage children, they were still well below the level of children raised in Iowa City homes, demonstrating "to some extent what average homes operating in an average social milieu accomplish in the way of mental stimulation" (Skeels, 1938).

In a study of thirteen orphaned children (mean IQ, 64) who received special attention from thirteen institutionalized female morons (chronological ages from fifteen to fifty), Skeels and Dye (1939) reported that after receiving this care for periods ranging from six to thirty months all but four members of the group made IQ gains in excess of twenty points. One gained fifty-eight points. This dramatic improvement made the children adoptable. Skeels (1966) reports in a follow-up study that all thirteen children continued to improve after being located in homes; they became self-supporting in adulthood and did not seem to demonstrate the previously manifested signs of mental retardation.

Finally, Skeels and Harms (1948) studied adopted children whose parents were either mentally retarded or of very low socioeconomic status. Children with such parents might normally be expected to have IQ scores averaging between 80 or 90. In fact, they achieved a mean IQ of 106. Further, although the group contained a

disproportionate number of children with family histories of mental retardation, frequency of retardation was no greater than that of a random sample of the population. Since there were significant differences in IQ between the children and their natural parents (106 vs. 85), it appears that a high-quality home environment can actualize unsuspected potential.

The studies cited demonstrate the family's power to foster normal development primarily by showing what happens when children are deprived of home influence. The next section explores the range of effects that different family environments can produce.

Twin Studies

Only two studies (Newman, et. al. 1937; Burt, 1966) have investigated the effects of different home environments by holding constant the genetic factor. Although these monozygotic twin studies were conducted primarily to resolve the nature-nurture debate, they will be valuable here to the extent that their environmental measures are valid.

The statistical method for investigating the environmental (home) influence is to correlate differences in environment with differences in IQ or other criteria of child performance. A high correlation between scores within twin pairs mean that large differences in environment are directly related to large differences in IQ and that small environmental differences are usually associated with nearly similar IQ. A low correlation means that large environmental

differences are just as likely to be associated with small IQ differences as with large IQ differences.

Newman, Freeman, and Holzinger (1937) used three environmental indices of advantage (educational, social, and physical) obtained from five judges who read casework material on each of the twenty-two monozygotic pairs of twins studied. The pairs were separated at thirty-six months of age. Newman and his co-workers found the correlations between IQ differences and estimated social and physical advantages to be .51 (significant at .05 level) and .30 (not significant) respectively. The correlation between IQ and educational-advantage difference was a strong .79. Several pairs had IQ differences ranging from fifteen to twenty-four points. This analysis clearly indicates that better family environments can differentially influence measured IQ. Bloom (1964), taking a different analytic approach to the same data, arrived at a similar conclusion.

Cyril Burt (1966) in his study of fifty-three pairs of monozygotic twins reared apart used the parents' occupation as the environmental measure. Environmental differences were determined by comparing job categories which ranged from "unskilled" to "higher professional." Burt correlated the environmental differences with three IQ measures--group test, individual test, final assessment--and with school achievement. While he found a significant correlation for only one of the IQ measures (group tests), a strong (.74) relationship appeared between environmental differences and school achievement differences.

Since both studies used a very crude environmental measure (more precise ones are only beginning to be developed), commentators (e.g., Schockley, 1972) have found a variety of ways to interpret the results. Debate seems to center around the proportion of variance that can be attributed to environment as opposed to inheritance. Most researchers seem to agree, however, that the quality of the family environment can make a significant, measurable difference in the child's cognitive functioning.

Researchability Assumption

The researchability assumption is that within a given cultural context, the behavioral sciences can begin to identify parent-child interaction patterns which facilitate optimal development.

Often, after having raised one child, parents consider themselves child-rearing experts; and yet we have demonstrated that some parents are more effective "educators" than others. We feel that individual parents and the scientific community should continually search for better means of releasing our children's human potential. Book sales (e.g., Spock, Gessell) and the recent burst of interest in early childhood education (see Newsweek, May 22, 1972) indicate that many persons are searching.

Predictability

This first criterion for successful "identification" of "those parent-child interaction patterns which lead to optimal development"

means that various studies should consistently find similar and statistically significant correlations between certain independent variables (i.e., family characteristics) and certain dependent variables (e.g., child's IQ).

Wolf (1964) conducted a systematic review of research dealing with the relationship between family characteristics and the child's cognitive functioning. On the basis of these many studies he devised a sixty-three question interview schedule from which he then derived thirteen "Environmental Process Characteristics" scales. Dave (1963) used the same schedule to formulate five slightly different scales which he designated the "Index of Education Environment."

The data from interviews with the mothers of sixty fifth-grade students was correlated with the children's IQ (Wolf, 1964) and school achievement (Dave, 1963). Wolf found a striking .70 correlation between a cluster of six of his scales and measured IQ. Dave found an even more impressive (.80) relationship between his "Index" and the children's "Educational Achievement Score" which measured vocabulary, spelling, computational skills, etc.

The key factors which produced the high correlation in Wolf's study were as follows:

- (1) Parental expectation for intellectual achievement
- (2) Amount of information the mother had on the child's intellectual achievement
- (3) Opportunities provided for enlarging the child's vocabulary

- (4) The extent to which the parents created learning situations for the home
- (5) The extent of assistance in learning situations related to scholastic and non-school activities.

Dave identified these items:

- (1) Achievement press
- (2) Language models in the home
- (3) Academic guidance provided in the home
- (4) Parental encouragement to explore the larger environment
- (5) Intellectual interests and activity in the home.

These two studies represent particularly strong "predictability" evidence because they were based on findings from previous work of a number of investigators and because they found such high correlations between independent and dependent variables.

Another way to demonstrate that parent-child research meets the predictability criterion is to isolate a single family characteristic and show that "various studies" have "consistently found" a significant correlation between this variable and the child's performance. We will use parental expectation as an example case.

Even before Rosenthal's (1966) classic experiment, child specialists hypothesized that parental expectation ("aspirations" is also used) of their child's intellectual performance would shape that performance. Milner (1951) found that children of parents who

expected ("demanded") high standards of behavior were much more likely to score well on reading readiness tests than were children whose parents expected less. Rosen and D'Andrade (1959) reported that parents of boys (nine to eleven years) with high need achievement have higher aspirations for their sons and set standards of excellence. Based on longitudinal data collected at the Fels Research Institute, Kagan and Moss (1962) conclude that "the pattern most likely to lead to involvement in intellectual achievement in the boy is early maternal protection, followed by encouragement and acceleration (their term for 'expectations') of mastery behaviors." Reporting on the thirty-year Berkeley Growth Study, Honzik (1967) states that the Berkeley data amplifies the conclusions of Kagan and Moss. Both of these longitudinal studies, however, discovered clear sex differences; males were more highly influenced by parent expectation than were females.

The findings of more recent studies harmonize with those already cited. Rhoades (1968), for example, in a questionnaire study of 7,000 subjects, found that "subjects' plans to enter college were closely associated with the mother's expectations."

While many additional corroborative studies (e.g., Bing, 1963; Pavenstedt, et. al., 1967; Katkovsky, et. al., 1964; Rau, et. al., 1964) could be mentioned, it seems clear that the first criterion has been met by the research to date. Dissonant evidence (Biglin, 1964; Cox, 1968) has been weak and only indirectly related to the specific variable at issue.

Specificity

Although knowing parental expectations may help us to predict child achievement, the independent variable lacks specificity. In what way do parents express and make known their expectations? What specific behaviors should parent educators encourage? To meet the "specificity" criterion, behavioral scientists must provide answers to such questions.

Specificity here refers to the degree to which global, abstract variables are operationalized and made concrete. For example, researchers (Kagan and Moss, 1962; Katkovsky, et. al., 1964) have found that parents translate high expectation for the child into greater participation in his work at home. To demonstrate that critical parental variables need not be vague (e.g., "maternal warmth") or general, a number of observation studies will be discussed.

Hess and Shipman (1965) have conducted a series of studies which explore the theoretical work of Bernstein. In brief, Bernstein's (1961) thesis is that the structure of the social system and the structure of the family shape communication and language which in turn shape thought and cognitive styles of problem-solving. He says that there are two general codes or styles of verbal behavior, "restricted" and "elaborated." "Status" or authority-oriented family structures lead to restricted codes, while "person-oriented" structures lead to elaborated styles. The difference can best be understood by

an example. If a child tried to get his mother's attention while she was talking on the phone, the status-oriented mother might reply, "Be quiet!" The person-oriented parent does more than give orders which carry weight solely because of her "status" or "authority." She might say, "I can't talk to two people at once. Wait until I've finished with my phone conversation."

Hess and Shipman (1965, 1967) observed 163 mother-child interactions when the mother taught her child a series of tasks which the child then performed for the experimenter. They predicted that different maternal verbal and teaching styles led to different levels of child performance.

A strong, positive correlation was found between the use of restricted codes and poor performance. Further, they conclude that the "most successful teaching styles showed specificity of language and organization and sequential presentation of material to be learned" (Hess and Shipman, 1967). More recent studies confirmed these conclusions.

Leler (1970) found the mother's "mean length of utterance" and appropriate use of reward to be related to high language test scores. Brophy (1969) discovered that maternal specificity of directions influenced performance. Bee, et. al. (1969) determined that modeling followed by explanation and positive reinforcement improved task completion scores.

Bing (1963) and Busse (1967) investigated the effects of other variables. Both found the parents of high achievers gave more and

quicker assistance when the child asked for it. Busse noted that the parent must allow time for the child to work without parental intrusion. Bing emphasized that children who scored well on verbal tests had parents who punished more for poor performance and gave more praise for good performance.

Amount and quality of family or home resources is another concrete variable identified by a number of researchers. After controlling for social class, Milner found that high scorers on first grade reading tests had more books available. Other important factors include toys and play space (Wolf, 1964; Moore, 1968).

Undoubtedly, a host of physical and human factors must blend and harmonize to create an optimal environment. La Crosse (1969) and Litman (1969) are working on a project which promises to develop a list of measurable factors more comprehensive and specific than what we now possess. It seems clear that there is general movement toward clear observable definitions of vital family characteristics.

Validity

As we have discussed the many studies substantiating both the predictability and specificity criteria for the researchability assumption, no mention has been made about causality, research quality, and other matters pertaining to the way in which findings are accepted and interpreted. Implicit in the researchability assumption is the notion that research design and methodology are sufficiently sophisticated to provide meaningful data. We have

termed this notion "validity." (Validity here does not refer to its narrow statistical meaning.) To explore the "validity" of available research, we will both review and criticize the various types of research designs, variables, populations, and data collection methods typically used in parent-child studies.

Research Designs. Most studies in the field have used a retrospective, cross-sectional approach. Less than five major longitudinal studies have been conducted. More recently, experimental or intervention type studies have become popular. Of course, no one research strategy can solve all problems and withstand all attack. Bell (1958) criticizes cross-sectional, retrospective studies because they assume (1) that parental attitudes can be extrapolated back in time, (2) that there is a strong relationship between attitudes and behavior, (3) that parents can give reasonably objective information about a subject with which they have a high degree of ego-involvement, and (4) that parental attitudes about child-rearing in general apply equally to every child. After painting a gloomy methodological picture for retrospective studies, Bell goes on to offer ways in which these shortcomings can be minimized. He further states that their real value may not be for prediction but rather for generating hypotheses which can then be investigated by other means. Longitudinal studies also have strengths and weaknesses. They provide an excellent means for control of environmental factors and avoid dependence on subject recall data which are complicated by forgetting,

repression, and distortion. If frequent accurate measures of the subject's status are made, the importance of the data will far outweigh difficulties such as maintaining contact with families for long periods of time, finding researchers willing to commit themselves to a study of the necessary duration, and minimizing the adverse effect of personnel and organizational changes.

Experimental studies can complement the above approaches. Once we have identified (through cross-sectional or longitudinal studies) factors which seem to facilitate growth and development, experimental programs can be devised to test our hypotheses. Although such programs may not completely control for extraneous influences, they can bring us somewhat closer to certainty about causal relationships.

Variables. The number of variables investigated in the studies is immense. Several reviewers (e.g., Hess, 1969; Gordon, 1969) have attempted to categorize them. While many appear similar, they are often defined slightly differently and measured by different instruments. Certainly this variety in parent-child research limits our ability to make conclusive statements. It may be that we are in an exploratory stage which precedes the discovery of some theory that will both establish uniform, generally accepted definitions and give direction to research. On the positive side, there has been a general trend toward measuring more specific, observable factors (e.g., verbal style).

Data Collection. Because of its efficiency, the questionnaire has been the most frequently used technique. Studies using interviews

are also quite common. In the past ten years, however, a growing number of researchers have turned to direct observation methods of various sorts (e.g., home, laboratory, structured, unstructured). In each of these three types of research, the mother and her child typically provide the data.

The questionnaire method has drawn the most criticism. The problems inherent in subject recall (i.e., forgetting, repression, and distortion) have been investigated empirically and reviewed by Freeburg and Payne (1967). In general, studies have found relatively low correlation between self-report questionnaire data and direct observation ratings. Bell (1958) and Hoffman and Lippitt (1960), however, feel that most problems in questionnaire administration stem from misuse rather than intrinsic faults. The less economic interview approach has many of the same sources of bias and error as the questionnaire (Yarrow, 1963). Compounding the amount of error in most parent-child attitude correlation studies using interviews or questionnaires is the practice of deriving both the independent and the dependent variable from the mother. Unfortunately, studies rarely utilize independent sources of data to cross-validate the mother's input.

These factors have led a number of investigators to abandon subject self-report methods and shift to direct observation of parent-child interaction. Although not without shortcomings (e.g., observer interaction effects, high cost), observation

techniques not only eliminate subject filter bias, but also free researchers to go beyond the habitual inventory categories by actually seeing previously unsuspected influences at work.

Populations. Prior to the sixties, most parent-child studies were done with white, middle-class subjects. Since race and class issues have grown in importance, we find a large number of researchers who have focused on "deprived" groups. The experimental or intervention projects (reviewed by Gordon, 1968) provide the best example of the new interest.

Since most of the populations selected for family studies have not been random samples, the question arises concerning the degree to which the findings can generalize. Hoffman and Lippitt (1960) consider this basic problem of social science research by distinguishing between statistical generalization and theoretical generalization. Statistical generalization refers to the ability to give accurate information about a given population (i.e., its mean age, use of punishment, etc.); when making any statement about some characteristic of that population, it is crucial to have a random sample. Theoretical generalization refers to hypothesizing about relationships between variables. The process of inducing general laws from given facts (empirical studies) is always precarious and requires the investigator to consider what factors within a given population might have influenced the results. Here a biased or random sample is useful. In this sense, then, all of the studies have some value.

To summarize evidence supporting the researchability assumption, we might say that, although the family environment presents some unique difficulties for systematic research, it is not inherently more mysterious than other spheres of human behavior. The fact that scientists are making better predictions (criterion one) and specifying more clearly the variables involved (criterion two) and discovering more appropriate ("valid") research strategies (criterion three) bodes well for the future.

Class-Independent Assumption

The class-independent assumption is that family characteristics, not class or race, determine a child's performance.

Social class has probably been the most frequently suspected and investigated "cause" of differential performance (Hoffman and Lippitt, 1960) among children. Although we find little agreement concerning the way this variable should be defined or conceptualized, there is consensus that a positive correlation exists between class status and cognitive functioning. This fact has led some policy-makers to conclude that education can make little difference (Coleman, 1966) in the child's performance. Accordingly, it is our purpose here to show that family characteristics, not class or race, determine a child's performance. This does not say that all characteristics are found equally distributed among all classes. It rather implies that members of any class can improve their "parenting" by developing certain qualities or practices.

Our ability to substantiate the class-independent assumption has increased during the past decade with the development of more sophisticated measurement techniques and the identification of key environmental variables. The broad concept "social class" has been broken down into observable component parts, making the study of family influences more precise. Dave (1963), for example, identified twenty-two "process characteristics" which correlated more strongly (.80 vs. less than .50 for social class) with achievements than did class status--clear evidence supporting the class-independent assumption. He also found that the home most influenced achievement which it can readily affect, such as word knowledge; skills taught primarily by schools (e.g., arithmetic) were affected less.

Within a given class Rupp (1969) showed that reading achievement was directly related to certain parental behaviors. If significant differences can be found and explained within classes, it seems that the same explanations should apply between classes.

While the class-independent assumption does not deny that certain child-rearing practices may occur with greater frequency in some classes than in others, it should be mentioned that no simple class-practice relationship exists. Kagan and Moss (1962) found no relationship between the mother's social class and her relationship with her son during the first years; better-educated mothers were slightly more critical and acceleratory toward daughters during the same period, however. Stronger relationships were found between

social class and maternal practice during later years, but were weak enough to indicate a good deal of diversity within classes. Bradshaw (1968), while conducting a parent education program for lower class mothers, observed wide differences in type and amount of punishment, quality and quantity of verbal interaction with children, and permissiveness.

This diversity within classes accounts for the findings of a number of studies. Moore (1968) discovered that home resources (toys, etc.), encouragement for language development, and emotional atmosphere predicted IQ at age seven better than social class. In a longitudinal study, Werner, Bierman and French (1971) found that particular family characteristics (e.g., lack of emotional support) were the best predictors for certain theoretically expected behaviors (e.g., emotional problems). Compared to the more specific variables, social class was a less effective predictor of behavior.

Social class then appears to be a less useful index, first because it provides relatively low correlations with child behavior and second because its generality offers educators few clues for program development. This evidence supports the class-independent assumption. It appears that what parents do is important; class or race labels cannot account for the diversity of family characteristics.

Summary

Analysis of the importance of early experience and substantiation of the three assumptions regarding parental influence have served to demonstrate the general relevance of home-based education. If the early years are crucial, if parents do exert significant influence on their child's cognitive functioning, and if educators can begin to isolate critical parent-child interaction patterns, then it remains to consider what special relevance these facts might have for developing countries.

CHAPTER II

A RATIONALE FOR IMPLEMENTING HOME-BASED EDUCATION PROGRAMS IN DEVELOPING COUNTRIES

The Need for an Alternative

For better or worse, people in developing countries seem to aspire to the material gains already made in the North American and European countries. A sign of material wealth in the United States is our 200 billion dollar educational facility and our gigantic corps of teachers. Just as parents in this country see and have seen formal education as a preliminary step to social and economic well-being, so too do parents in Latin America strive to place their children in desks in front of teachers. It is unfortunate that this expensive arrangement has been so single-mindedly pursued in the United States. If the rich countries had been more inventive, and provided formal and non-formal alternative routes to knowledge, developing countries might not have assumed the task of providing an educational service that is currently beyond their means.

Another sign of our economic progress (and probably only incidentally a sign of our scientific knowledge of human development) is the movement to extend formal, compulsory education to children of pre-kindergarten age. Fortunately, there are indications that alternative ways of delivering early childhood education will be available.

The United States government through the Office of Education is exploring some of these alternatives and asking whether the most effective system for delivering early childhood services is necessarily the most expensive. The establishment of a new federal program called Home Start (O'Keefe, 1971) should provide an experience base from which to derive some tentative answers.

Home Start, like Head Start, provides three and four year old poverty children with nutritional, medical and educational services. Unlike Head Start, however, Home Start provides these services through the child's home rather than through a center. Its objective is to involve parents directly in the educational development of their children. This, of course, means that the parents' capacity to be educators must be strengthened.

The program, which is now operating in fifteen cities, trains indigenous paraprofessionals to go into the home and work with parent and child. Home Start has thus demonstrated that an alternative means of providing Head Start services is feasible. An evaluation to be conducted by the Office of Child Development will determine and compare the cost/benefit ratios of center-based and home-based programs.

We need not wait until that data becomes available, however, to assert that the home-based approach can be equally effective for a fraction of the cost; several studies support this conclusion. Barbrack and Horton (1970) compared the effectiveness of three home visitation projects which varied in cost according to the ratio of

professionals and paraprofessionals used in each program. The program which used professionals at all levels (i.e., from director to home visitor) was, of course, the most expensive (\$440/child/year); the others cost \$335 and \$275/child respectively. Pre- and post-tests measured the child's cognitive functioning (Binet IQ) and changes in maternal teaching style. Surprisingly, the least expensive program produced the most dramatic changes in parent and child behavior, thereby giving it by far the lowest cost/effectiveness ratio. When the \$275/child figure is compared with the cost of center-based kindergarten or nursery programs (usually \$500 to \$1,000) which might produce comparable gains, the cost advantages of the home-based approach become obvious.

The study of Barbrack and Horton shows that low cost and high effectiveness can be achieved by the heavy involvement of paid paraprofessionals. Keele and Harrison (1971) go one step further and show that parents (unpaid) were as effective teachers of their own children as were paid paraprofessionals. Another study, by Merle Karnes, systematically compared the effectiveness of five preschool programs. They differed in degree of curriculum structure and included both home-based and center-based alternatives. On the basis of her experience, Karnes (1969) concluded that,

"the practical nature of the (home-based) program in terms of facilities, budget, and personnel does increase its potential for reaching increased numbers of children. In communities where funds and facilities are limited, a mother-training program could provide an appropriate

alternative to a preschool experience for disadvantaged children. In areas of sparse population, it might prove more feasible to transport mothers on a weekly basis than children on a daily basis."

We might conclude from these three studies that using paraprofessionals to train parents to directly teach their children could be an appropriate means of delivering early childhood services in countries where resources are comparatively scarce.

Demonstrating the existence of relatively inexpensive ways of delivering early childhood services does not, of course, mean that such services are currently relevant to the needs of a developing nation, nor does it specify the way in which such a program could be tailored to meet those needs. The purpose of this section is to discuss the special relevance of home-based learning programs to developing countries. A case will be made in the context of three problems that are common to most developing nations--illiteracy, relative lack of education among women, and wastage.

Illiteracy

Whether viewed as an economic investment, as a factor in social betterment, or as an expression of human dignity, literacy stands out as one of the greatest felt needs in developing countries. In 1968 President Kenneth Kuanda of Zambia said, "The literacy program should be accorded a high priority in the planning of the country's development." Mahatma Gandhi declared, "Mass illiteracy is India's sin and shame and must be liquidated." Many economists agree that a 40 percent

literacy rate seems to be a necessary precondition for industrialization (Blaug, 1966). And yet, despite nearly universal consensus about the importance of literacy training, the absolute number of illiterate adults (15 years and older) is increasing every year in many countries of Africa, Latin America and Asia. The rate of population growth in these places is outstripping the expansion of the school system.

The question then is not whether literacy is a desirable goal, but whether adequate means can be found to achieve the goal. In this regard, one of the most frequently discussed and debated issues is whether to focus resources on primary education or adult education. It appears that the economic returns are greater from an investment in primary education than from adult education since each literate child will have a longer period with which to use his skills in the market. On the other hand, it costs more to train a child to read and write (4 to 6 years) than it does to teach an adult (1 to 2 years). Further complicating the matter is the fact that a literate parent is more likely to secure his child's school attendance, thereby eliminating wastage caused when the child drops out of school before he acquires permanent skills.

To date, most countries have opted for primary education. It is rare to find a place in which more than five percent of the education budget is allocated for adult education. These priorities are being reevaluated however. President Nyerere of Tanzania announced to his Parliament, "First we must educate adults. Our children will not have

an impact on our economic development for five, ten or even twenty years. The attitudes of the adults, on the other hand, have an impact now." The advent of the "functional" approach to literacy training has given additional incentive to policymakers to redirect educational resources to out-of-school youth and adults (U.N.E.S.C.O., 1970a). This method avoids the use of primary school texts, the content of which does not relate to the needs and interests of adults. The functional approach integrates job training with literacy acquisition, thereby making a connection between vital interests and academic skills.

By developing an adult literacy program with child development content, a home-based program could simultaneously break through the primary/adult education dichotomy and create a new kind of functional literacy. If we view each adult as a potential teacher of his children, then early education, primary education, and literacy training could be fused. But would this fusion be a vital one? Would it be functional in terms of the daily needs and interests of a village family? Although experimentation is needed before giving definitive answers, we can make speculations based on already known facts.

Parents universally desire the best care for their children. This includes education. "The motivation to literacy in developing countries is shown as its strongest in the desire of parents for their children to enjoy education" (Phillips, 1970). Sheffield (1967) showed that villagers have more desire for their children's education than for

themselves. This does not mean, however, that parents do not wish to be literate. To the contrary, although the reasons vary, nearly everyone feels that literacy is a good and useful thing (Phillips, 1970). It appears then that by giving parents the means to provide literacy and pre-literacy training for their children we can capitalize on attitudinal strengths within the village community. A new process could be set in motion in which adult education and primary education become united through the mediating experience of a helping relationship. When the learning through teaching principle is in operation, the adult will find a greater sense of dignity and purpose resulting from his efforts. In the United States, this has been confirmed in a number of programs (e.g., Karnes, 1969) where poor parents have made sacrifices to acquire the knowledge and skills needed to work more effectively with their children.

Education of Women

A second common problem for which home-based education may have special relevance is the relative lack of education among women (U.N.E.S.C.O., 1965, 1970b). While in the United States the median number of years of schooling for men has until last year lagged behind the figure for women (Phi Delta Kappan, 1972), the situation is often reversed in developing countries (U.N.E.S.C.O., 1970b). Commenting on this, H. M. Phillips (1970) writes,

"Greater attention should be given to women's and girls' education, since their influence in the home goes far beyond that of their home duties. Productivity of

workers in industry and particularly in agriculture often has a direct relationship with the mother of the family, who if literate is able to introduce into the family's way of life the new ways of thinking which, as we saw in Chapter 3, the ability to read and write tends to foster."

Unfortunately, while "greater attention" is required, it appears that women will be excluded de facto from many of the new functional literacy programs which, since they focus on vocational skills, will most likely be serving men. It seems logical then to either open the job market to women or develop adult education programs that are functional in terms of the female role. Thailand, for example, is trying the latter approach by using literacy materials which have family planning content (World Education, 1971). Other countries use nutritional information as the basis of their programs (Odokara, 1970).

Other potentially useful content areas for home-based learning have been outlined by Spitze (1968) who defines "homemaker literacy" as being able to read signs, notices, instructions, local newspapers, and simple homemaking bulletins; possessing writing skills necessary for filling out forms, doing correspondence, and keeping family records; and knowing how to use numbers well enough to compare prices and complete money transactions. Although persons in remote villages might not have the opportunity to use all these skills today, the time is approaching when rural people will need an educational program geared to a more modern life style. A non-formal, home-based delivery system might be an appropriate vehicle for such a program.

Besides providing women with access to literacy skills, such a system could open a new profession for which women might be particularly well-suited.

Wastage

Wastage (i.e., elementary school desertion prior to the completion of grade six) is a third problem common to developing countries. While it might be argued that any amount of school is useful in some way, most development education experts define "useful" as the permanent acquisition of literacy skills. Since four to six years of elementary education are necessary to produce permanent literacy, it is considered wasteful to attend one to three years of school. The "good" done during that period is hardly measurable and probably inconsequential to the country's development needs.

What is the magnitude of this problem? Statistics (U.N.E.S.C.O., 1970a) show that in many countries about 20 percent of the population has attended more than two years of school but remained illiterate. When we see that 35 to 55 percent attended less than one year of school, it becomes apparent that the two-to-four group (wastage level) will probably grow as education becomes generally more available and there are fewer people in the zero-to-one year group. From an economic standpoint, this means increased wastage of scarce funds.

What adjustments in the educational system could reduce the magnitude of this problem? In what way can home-based education assist in the task? Paradoxically, one possible answer to these

questions might come through considering the merits of late school enrollment. By "school enrollment" we mean learning to read and write in a formal setting. "Late" enrollment here refers to school entrance at age eight or nine. The rationale for late school enrollment is based on evidence from three sources: 1) studies and theories of cognitive development, 2) neurophysiological research, and 3) studies comparing early and late school entrants. Each will now be reviewed briefly.

Theory of Cognitive Development. Hans Furth (1970) explains in some detail the educational implications of Piaget's developmental theory. He points out that learning to read is essentially a low-level cognitive task (termed "figurative" or "low-level operative"). It requires only memorization and labeling of objectives with written symbols. This presents two problems. First, since this menial cognitive task does not challenge the child's thinking capacity, he usually finds it unrewarding and therefore tends to develop negative attitudes toward school work in general. Second, the lack of challenge not only fails to draw the child to higher stages of cognitive functioning, it also can reinforce "pre-operational" thinking, causing the child to "fixate" at that lower level. By waiting until the child reaches the stage of "concrete operations" (usually around ages eight or nine), there is no danger of regressing to the pre-operational level while engaging in the menial job of acquiring a written vocabulary. Furthermore, at that age (eight or nine) the

child is able to handle syntactical structures sophisticated enough to convey propositions that challenge this thinking ability. Furth does say, however, that,

"When the child spontaneously engages (at ages less than eight) in figurative knowing (e.g., learning the alphabet), as in ordinary conversation or in play, he does so for his own good reasons that stem from her personal needs and conditions. If he readily accepts the teaching and learning of figurative skills, there is perhaps no harm in that. But when reading is overemphasized and the child for intellectual, social, or emotional reasons is not ready for it, then we should not be surprised at the number of intellectual and social failures we see around us." (Furth, 1970, p. 70)

Research related to Piaget's theory also supports Furth's conclusion, but for different reasons. Almy, et. al. (1966) found that only half of the second grade children were able to successfully perform three Piagetian tasks which measure a kind of cognitive functioning normally required for primary grades. Due to his lack of readiness, many second grade children are not benefiting from what goes on in their classrooms. Sewerer (1972) found that multi-dimensional classification is a prerequisite skill for effective reading and that this skill is not required until the child is in the operational stage (usually around age eight).

Neurophysiological Research. Moore, et. al. (1972) review a large body of physiological research which corroborates Furth's view that changes critical for a successful reading experience occur around age eight. Davis (1964) notes that the child's brain is not fully insulated or completely developed until after age seven years.

Birch and Bortner (1960) discovered that until this age children were often inaccurate in their perception of shapes. Electrical impulses from visual stimuli trace many of the same brain paths as do the impulses generated by cognitive activity. Not surprisingly, therefore, researchers have found that visual maturity is achieved at an age comparable to cortical maturity. Cole (1938) observed that some children are unable to focus objects at close range until age seven or eight or later. She also discovered that 90 percent of five-year-old children are unable to see any difference between "d" and "b" or "p" and "q". By age eight these confusions do not exist for most children. Wepman (1968) found that in some children the ability to retain and recall speech sounds is not well developed until age nine.

Late School Entrance Studies. Both cognitive theory and neuro-physiological research indicate that postponing school enrollment until age eight might be desirable in some cases. Actual studies comparing early and late school entrants confirm this hypothesis. Inez King (1955) studied two groups of children. The first entered school during their fifth year of life; the second entered during their sixth year. At grade six scores on standardized achievement tests were compared. Not only did the group of later entrants outperform the other group on these tasks, they also were judged to be much better adjusted to school life. Husen (1967) more frequently found negative attitudes toward school among early school entrants.

Studies by Carroll (1964), Halliwell and Stein (1964), and Hampleman (1959) also found that later school entrants significantly outperformed earlier school entrants. Although little has been done to measure retention of skills at certain ages, it is generally agreed that younger children retain less of what they learned during a school year. Keister (1941), for example, showed that although some five-year-olds were "ready" to assimilate first grade reading materials, very few retained the skills through the summer.

The evidence cited indicates that the likelihood of wastage of educational resources is high when all children enter formal schooling at age six. If a country cannot afford to educate everyone, it seems that care should be taken so that those who do receive attention: 1) are ready for it, 2) will retain it, and 3) will not be hurt by it. One way to reduce wastage deriving from the first provision would be to administer diagnostic readiness tests prior to school admission. All three conditions, however, could be addressed to providing a non-formal, home-based alternative to formal schooling up to age eight. This would guarantee a much higher percentage of "ready" learners, who can retain material, and who would not be stifled in the way Furth describes.

The argument here is somewhat negative. We are saying that schooling (as currently defined) during ages five through seven is relatively ineffective for relatively more children compared to schooling for eight and nine year olds. We are not asserting that

useful pre-reading experiences could not be offered in a formal setting, although it is questionable whether those institutions could adjust their mode of operation sufficiently.

The argument is positive to the extent that a home-based alternative to grades one and two could provide useful pre-reading, pre-school experiences. The nature and range of those experiences, and systematic attempts to provide them in the home, is the topic of the next section.

Summary

The purpose of this section has been to demonstrate the special relevance of home-based education to developing countries. A case has been made that three common problems--illiteracy, education of women, and wastage--might be addressed by exploring the educational potential of the home. We discussed a way of simultaneously promoting literacy among adults and children, and mentioned the possibility of creating a literacy program that would be functional in terms of the woman's role. Finally, we suggested that learning in the family environment up to age eight could preclude some wastage of school resources.

While we conclude that such an approach merits experimentation, we are not unaware of some possible barriers to its success. For example, although most adults desire to improve their literacy skills, the amount they wish to learn might be only sufficient to sustain a program of the briefest duration. Resistance to late school

enrollment might be another problem encountered. Finally, an analysis of reasons for school leaving might show that postponing school enrollment would have the effect of keeping many children from ever enrolling. Actual attempts to deal with these problems are reviewed in the section entitled, "Home-Based Education--The Range of Alternatives."

CHAPTER III

HOME-BASED EDUCATION--THE RANGE OF ALTERNATIVES

Parents universally desire to provide the best care for their children. This includes education. Yet while many parents want education for their children, few perceive themselves to be potent, systematic forces in the educative process. In general, they lack: 1) the techniques necessary to operationalize the interest and concern they have for their child's development, 2) the materials that can facilitate constructive interaction between parent and child, and 3) the self-image of being effective teachers.

The purpose of this chapter is to review programs which have attempted to meet these needs. Seeing a broad range of possibilities should stimulate one to think of ways such an approach might be adapted to a particular country or setting.

In order to describe the panoply of programs in a useful way, we have organized the information in sections as follows:

- I. Objectives of Home-Based Programs
- II. Curricula and Materials
- III. Training Methods
- IV. Delivery Systems

Each of these sections will be introduced by a discussion of issues, concerns, or controversies related to the section topic.

Objectives

Discussion

In general, home-based programs reported in the literature have provided child-rearing skills and information to persons from poverty backgrounds. Many program objectives are stated in reference to national or middle-class norms which are above the level exhibited by participants. This unfortunately can lead to the erroneous conclusion that family programs must be a blatant form of cultural invasion (Baratz and Baratz, 1970). While the potential certainly exists for this, several factors mitigate the issue.

First, a substantial number of parents from all races and social classes admit to needing, and, indeed, seek guidance in relation to child rearing. Middle-class mothers, who are not eligible for much government assistance, must contract private agencies. Since these agencies are less likely to publish their work in scholarly journals, it appears that there is an imbalance in favor of poor parents in the amount of family education being dispensed. However, this may be misleading. Book sales (e.g., Spock) indicate a strong interest among middle-class mothers in filling their child rearing information gaps.

Second, most programs are explicitly sensitive to the intercultural issues. The heavy use of indigenous paraprofessionals helps ensure the preservation of cultural values. Also, recruitment procedures include careful explanation of program objectives. If these objectives are not acceptable to a potential participant, he can

simply refuse to participate. It happens that most parents are enthusiastic about such programs.

Finally, some projects have formed objectives subsequent to interaction with participants. The Rural Family Development Program (1972), for example, conducted a survey to determine interests and needs of the target population. Instead of creating a standard curriculum, Jones (1970), in a different project, simply supported each individual home visitor in meeting the expressed needs of their client families.

In viewing the range of specific program objectives, we might organize them into behavioral and attitudinal changes among three participant groups: children, parents and paraprofessional staff.

Objectives Relating to Children

Most objectives for two to five-year-olds fall into cognitive, linguistic, affective, motor and perceptual areas. Emphasis is frequently placed on language development as measured by the Illinois Test of Psycholinguistic Ability (ITPA), the Peabody Picture Vocabulary Test, and many other less known and locally created measures (e.g., Micotti, 1970, used tests written in Spanish). Nearly every program aims to improve cognitive functioning. The Stan Binet is typically used to measure this variable. To date, affective objectives such as enhancing self-concept have existed more as part of program philosophy and rhetoric than as guides for specific program activities. This is due in part to the relative scarcity of

evaluation instruments which satisfactorily measure feelings and attitudes. Recently, several programs (most notably those under the Home Start umbrella) have pursued health and nutritional objectives. Providing a proper diet and correcting for visual and auditory defects are considered important prerequisites to other goals.

Objectives for children of primary school age are usually more directly related to school performance. Grades, attendance, and teachers' comments are often used as bench marks for success. More commonly, however, standard achievement tests are employed to determine language and mathematical proficiency.

Objectives Related to Parents

Recently, home-based programs have shown increasing interest in the salutary effects that enhancing the mother's role as teacher can have on her total life situation. Badger (1970), Horton (1968), and Hawkins and Sluyter (1970) all have program components whose function is to encourage and assist parents to become active in community and/or school affairs. In several other programs, this occurred spontaneously without any systematic effort. Gordon's (1969a) "How I See Myself" scale and Head Start's "How I Feel" questionnaire have been used to measure changes in self-concept thought to be related to increased community involvement. Objectives more often found in home programs are those concerning child-rearing skills and knowledge. Several measures have been devised to assess progress in these areas. The DARCEE (see Dokecki, 1970) Maternal Teaching Style

Instrument, available in both English and Spanish versions, is probably the best known. Gordon (1970), Karnes (1969), and others have also developed observation protocols which evaluate the mother's skill or knowledge.

Since parental attitudes and expectations have been found to influence the child's growth, many programs also attempt to change attitudes. The Parent Attitude Research Instrument (PARI) created by Schaefer and Bell (1957) is the most widely used measure of change in this area. In addition to changing attitudes and behavior related to child development, several programs use the mother's role as teacher as a vehicle for her own direct benefit and learning. Karnes, for example, found that the mother's language skills improved in the process of teaching her child to speak.

Objectives Related to Paraprofessional Staff

The training and heavy use of indigenous paraprofessionals in home-based programs has developed an untapped community resource. Most training programs set objectives directly related to home visiting activities such as knowledge of child development, teaching skills, and leadership skills. Gordon (1969b), Weikart (1970a) and others discovered that there were some desirable by-products of the training and of the service that paraprofessionals performed. Self-confidence, community involvement, and indices of quality of home environment all increased for the parent educators. Several programs which have become conscious of these potential effects now systematically pursue them.

Curriculum and Materials

Issues

During the past eight years, at least ten family education projects have conducted major, independent curriculum development efforts. Several of the authors have attempted to specify criteria by which to judge the quality of either written materials or educational toys. Gordon (1970) states that the major difficulty in establishing effective home programs will be the "creation of home learning materials which match the mother's background, education, and motivation; the needs of the child and of the family; and the goals of the program designers." One of Gordon's associates, Malcolm Garber (1971), identified the following qualities as being important for effective mother/child tasks:

- 1) The learner does a lot of talking.
- 2) The task should be fun.
- 3) Clear directions for the parent should be provided.
- 4) Rationale for doing the task should be understandable to both mother and child.
- 5) Task should encourage a variety of ways to teach.
- 6) Materials typically found in the home are used.
- 7) A clear way for the learner to know what he has learned is available.
- 8) Task keys the learner to additional related activities.

Levenstein (1971) feels that materials must be self-rewarding, challenging, and stimulating to the senses. Weikart (1969) takes a somewhat different approach by evaluating his curriculum materials less in terms of the child and more in terms of the parent. Do they challenge and interest the parents? Do they provide adequate structure to prevent undue anxiety?

While most program developers have placed emphasis on the curriculum development aspect of their projects, recent research indicates that energy might do better spent elsewhere. Kohlberg (1968), after reviewing a number of preschool and home-based education programs, concluded that a variety of apparently different stimulation methods were functionally equivalent. That is, none produced markedly different effects on cognitive development. Weikart (1969) confirmed this finding when he compared the effects of three preschool curricula which, according to 850 visitors (including many early childhood specialists), were "different in theoretical commitments and differentiated in application." Data from this experiment showed that each of the three curricula performed equally. Based on this discovery, Weikart concluded that "the heavy emphasis on curriculum development, while important, has greatly overshadowed the need for careful attention to both the staff model and program operation (structure, administration, etc.) employed by a project."

With this in mind, we will now review the range of family education curricula and materials. For convenience, they have been

organized according to the groups for which they were designed:

1) preschool children, 2) primary school children, and 3) adults.

Home Education Curricula for Preschool Children

Ira Gordon's (1967, 1969a, 1969b, 1970a, 1970b, 1971a, 1971b) pioneer efforts in home-based education established standards and provided points of departure for subsequent programs. The curriculum developed in his program rested on a theoretical foundation mainly of Piaget and Montessori. Suggested activities and materials have been compiled in two books available from St. Martin's Press in New York. The one for two and three year olds is entitled, Child Learning Through Child Play. While the materials and activities are quite specific (and easy to understand), Gordon intends that they be viewed as starting points from which the parent may depart and adapt as they see fit. The books are well illustrated, written at about a sixth grade level, and include instructions for making toys and games out of materials typically found at home.

David Weikart (1969a, 1969b, 1971) developed three curriculum packages. The most original is called the "Cognitively Oriented Curriculum." Based on the work of Piaget as interpreted by Uzqiris and Hunt, this curriculum identifies developmental sequences and suggests activities which will facilitate the growth of each specified skill in the sequence. Although the activities are clear and simply written, a high degree of teacher competence is required to understand the underlying principles of development. One advantage, however, is

that this curriculum, since it focuses on universal processes underlying development, is reputed to be culture free. Weikart's other two curricula, "The Language Training Curriculum" (based on the highly structured Bereiter-Engelmann program), and "The Unit Based Curriculum" (which resembles a traditional nursery program) are also "exportable" and available from the High/Scope Research Foundation in Ypsilanti, Michigan.

Merle Karnes (1968a, 1968b, 1969a, 1969b, 1970a, 1970b), like Weikart, experimented with several curriculum approaches. Probably her most significant contribution to the field is called "The Ameliorative Program." Apparently not an outgrowth of any one theoretical viewpoint, the "Ameliorative" approach emphasizes language development through manipulation of concrete objects which serve as the focus for verbal responses. Her book of activities, entitled Helping Young Children Develop Language Skills, is available from the Council for Exceptional Children in Arlington, Virginia. The style and difficulty of the book appear geared to professionals rather than parents.

Phyllis Levenstein (1971a, 1971b, 1971c) uses an approach similar to Karnes. She has selected 24 books and 22 toys which meet a set of criteria developed by her project staff. The unique feature of this curriculum is the "guide sheets" which describe the way each toy should be used and which indicate an evaluation procedure for each activity. The sheets are simple and easy to handle, but, unlike the books and toys, are unavailable commercially.

The program developed at George Peabody College's Demonstration and Research Center for Early Education (DARCEE) has used research findings more than theory in developing its curriculum (Gray and Klaus, 1969). The curriculum units and manuals suggest activities which might be found in many traditional nursery schools. They are very simply written for use by relatively uneducated parents and home visitors. They can be purchased by writing DARCEE in Nashville, Tennessee.

Glen Nimnicht (1970) carefully selected nine simple toys which are used by parents to teach three and four year olds. The toys including the "feely bag," the "sound can," and a spinner board with numbers and letters have been found to consistently hold the attention of both parents and children. A booklet is available from the Far West Regional Laboratory in Berkeley, California which provides simple instructions for making and using each toy. Parents usually gather for toy-making sessions which use the booklet; this approach stimulates interest and instills confidence in the parent that he can use the toy.

Ronald Parker's (1972) Discovery Program is probably the most sophisticated, comprehensive, and technology-oriented curriculum available. It has served an educated clientele. The program content is defined by over 1,800 behavioral objectives classified in cognitive, language, affective, motivational, social, and motor areas. The elaborate Take-Home materials are self-instructional.

Several programs have developed home-learning materials to be used in conjunction with media broadcasts. Robert Filep (1971) produced the "Sesame Street Viewer Volunteers Guide" which assisted mothers of inner-city children to reinforce Sesame Street lessons. The Wisconsin Rural Family Development Program (Frank, 1972) developed its own television series which was supported by home study materials covering a wide range of adult interest topics including home improvement, budgeting, health, nutrition, and child development. The curriculum is divided into one page "units" which the adult collects and saves in a notebook. The Appalachia Preschool Education Program (Appalachia Educational Laboratory, Inc., 1970) also coordinated a television series (for children) with home materials that the adult used with the child. The content is highly culture-based and is used to expand the children's familiarity with places and things.

The above list of curriculum packages is illustrative of the range of available alternatives. There are others such as the Parents As Resources Program (1970) or Boger's (1969) "Structured Language Program" which were not discussed due to their similarity to the better known programs. It should be mentioned that several useful resource materials have been developed apart from the major curriculum projects. For example, Joan Beck (1965) has compiled about 100 three-frame comic strips which assist parents in teaching children to read. Priority Innovations (Skokie, Illinois) distributes easy-to-administer diagnostic tests that tell parents what

skills to work on with their children. They also have a series of about 30 single-frame cartoons, each of which illustrates a basic child development principle.

Before discussing curricula for six to ten year olds, we should mention that several home programs do exist which purposefully avoid using any predetermined curriculum plan. Jones (1970) reports that her home visitors each develop their own "curriculum" after getting to know the mothers. They do not even assume at the outset that the mother will want or should want information about child rearing. Archambo and Briscoe (1970) use a non-directive approach which is responsive to the parents expressed needs.

Home Education Curricula for Primary School Age Children

Unfortunately, far less exists in this area than in the previous one. Despite numerous studies which have demonstrated the salutary effects on student achievement of increased parental involvement in school-related matters, we have found only two programs which systematically trained parents as home teachers of their primary age children.

A. J. Tannebaum (1967), the director of a project called Supplementary Teaching Assistance in Reading (STAR), developed 21 structured lesson plans which were in worksheet format. Available in both Spanish and English, the lesson plans were independent of any school curriculum. Older siblings, as well as parents, were able to serve as "teachers" using the STAR lesson plans.

The Southwest Regional Lab's Parent-Assisted Learning Program (Niedermeyer, 1970) used highly specific programmed materials to teach skills (such as spelling) for which repetition and practice are relevant tasks. The home tutoring materials were related to a regular classroom curriculum, but might stand on their own. They were geared for first and second grade students.

Home Education Curricula for Adults

Several home education programs provide information or skills that are not directly related to the raising or educating of children. World Education, Inc. (1971) uses literacy materials with family planning content. A picture with a key word on one side of a programmed series of cards is supplemented by a full sentence on the reverse side. The Wisconsin Rural Family Development Program (Frank, 1972) surveyed rural adults and discovered a high degree of interest in information related to family life topics, opportunities for job improvement, and retirement options. Several one-page curriculum units were prepared on each of these subjects. Jeanne Preister (1968) directed a program which taught homemaking skills. An easy-to-read monthly newsletter supported and reinforced home visits.

Delivery Systems

Discussion

To date, the various delivery systems used in family education programs have employed a broad range of technological and human

resources. A growing body of evidence indicates that a combination of technological and human support produces the best results. Evaluative studies of Sesame Street, for example, show that children gain more from watching the program if they are joined by some adult (whether trained or untrained). The Wisconsin Rural Family Development Program (1972) assessed the effectiveness of different combinations of three delivery approaches: 1) home visitation, 2) television broadcast, and 3) mobile classrooms. Each one separately produced very little effect. In concert, the three made a significant difference in the academic performance of participants.

Since the goal of family education programs is to deliver information and services to the home, the issue of privacy arises. In the United States and elsewhere there exist strong beliefs, backed by civil law, which assert one's right to privacy at home. Family education runs the risk of violating these beliefs and laws. While we consider it a legitimate right of the state to require children to attend school, we should not impose similar requirements for family education. Being sensitive to these issues, most programs have stressed in their recruitment procedures that participation is purely voluntary.

To review the range of delivery system alternatives, we have identified ten types into which most programs clearly fall. Each is briefly described and analyzed in terms of its advantages and disadvantages.

Delivery System No. 1 -- Parent Teams or Clusters

1. Description:

Organizing parents or older siblings to care for younger children can be an effective way to focus attention on the educational aspect of child care and to free parents to do other things. A team might consist of five parents. They would receive initial training as a group and then would take turns caring for the other team members' children (as well as their own, of course). A paraprofessional could visit the "backyard classes" while they are operating to provide emotional and technical support.

2. Relative Cost: Extremely low since parent labor is volunteer.

3. Materials Required:

- a) Instructions for making toys and games (can be locally produced and allowed to rotate from class to class)

4. Facilities Required: Homes or "backyards"

5. Personnel Required:

- a) Short-term professional to train visitors
- b) Parapro visitors (one for each 15 classes)
- c) Most labor volunteer (mothers and siblings)

6. Main Obstacles:

- a) Soliciting participation
- b) Competing system (of assumed inferior quality; e.g., older siblings already fill the bill)

7. Relative Effectiveness: Uncertain, although many existing programs report significant gains in child achievement.

8. Program References:

Gordon, Ira. "Home Learning Approach to Early Stimulation" (ERIC 056750). Gordon describes several home education options including the "Backyard Center."

Dokecki, Paul. "The Training of Family Day Care Workers" (ERIC 053787). Part of DARCEE, Dokecki's work includes detailed plans for training parapro home visitors.

Filep, Robert. "The Sesame Mother Project" (ERIC 055676). Describes a program in which volunteer mothers reinforced Sesame Street lessons for groups of neighborhood children.

Johnston, B. "Early Education in American Samoa" (Ed. Hor. 12, Winter 1971-72). Trained parents to teach groups of three to five year olds at home. Entire island's children enrolled. Used local materials.

Delivery System No. 2 -- Television and Radio

1. Description:

Information can be broadcast to parents alone or to parent-child teams. Drama has been used to effectively communicate family living principles. Messages of the sort that everyone in the family can understand could be directed to the home or to classes, and should be of varying length (many short messages might be best).

2. Relative Cost: Extremely low for radio alone; high if teachers are included.

3. Materials Required:

a) Scripts

b) Radios

4. Facilities Required: Commercial time or private set-up

5. Personnel Required:

a) Script writers

b) Radio school teachers

6. Main Obstacles:

a) Acquiring access to radio

b) Creating high quality programs

7. Relative Effectiveness: Low (if no follow-up is done).

Effectiveness probably increases after personal contact with a facilitator.

8. Program References:

"Appalachia Preschool Education Program" (ERIC 052865).

Includes a well-developed curriculum. Program was coordinated with home visits and mobile classroom sessions.

"La Familia Gomez." Columbian educational soap opera.

Filep, Robert. "Sesame Mother Project" (ERIC 055676).

The Program, "Sesame Street," was reinforced by mothers at home. Support materials included.

Frank, Boris. Wisconsin Rural Family Development (064552). Comprehensive media approach supported by home visits.

Hanson, Marvin. "Effectiveness of Film in Changing Parental Attitudes" (ERIC 020659). One showing of a film about the parent's role in influencing speech habits resulted in significant attitude change.

Hyman, John. "Denver-Stanford Project on the Context of Instructional Television" (ERIC 018168).

Children whose parents watched and discussed the show with them made significant gains in language facility.

Johnston, B. K. "Early Education in Somoa" (Educational Horizons, Vol. 50, No. 2, Winter 1971-72).

Developed a twice weekly fifteen-minute television show for three to five year olds. Were planning a radio version in 1972.

Lloyd, H. M. "Developing the Role of Parents in Reading Progress" (Reading Teacher, 1965, 18, 629-33). Included spot announcements in television and radio encouraging parents to play an active educational role.

Delivery System No. 3 -- Community Resource/Toy Library

1. Description:

Based on specific instructions or models, community members make educational games and toys which are kept in a central place (church or school) when not out on loan to a family. A facilitator demonstrates how the games can be used.

2. Relative Cost: Within local means, since games are simple and materials basic.
3. Relative Effectiveness: Depends on intrinsic value of games.
4. Facilities Required: Some centrally located building such as a school or church could house the games.
5. Personnel Required:
- a) Facilitator (game demonstrator -- volunteer or paid)
6. Materials Required:
- a) Instructions for making and using games
 - b) Depending on the game, outside materials might be needed
7. Main Obstacles:
- a) Making the games accessible
 - b) Retrieving the games
8. Program References:
- Nimnicht, Glen. "Parent-Child Course and Toy Library"
(ERIC 045206). Specific instructions given for the use of ten toys.

Delivery System No. 4 -- Use of Schools for "Pre-Parent" Training

1. Description:

Academic credit can be given by high schools for courses in child development. Included in such a course of study would be actual experience caring for and educating young children. A high school could conceivably run a day care center.

2. Relative Cost: Extremely low (if it can replace something in the curriculum.

3. Relative Effectiveness: Unknown

4. Facilities Required: A child center attached to the high school would be desirable although in some programs the students go into nearby homes on a regular basis to care for or tutor the children.

5. Personnel Required: Variable--no additional personnel are absolutely required, but a child development supervisor would be helpful.

6. Materials Required:

a) Texts and other aids typical of any course curriculum

7. Main Obstacles:

a) Changing current school curriculum

8. Program References:

Hawkins, R. "Universal Parenthood Training"

(Educational Technology, February, 1971). A

rationale for including child-rearing as part
of the high school curriculum.

"Education for Parenthood." U. S. Office of Education.

A national program to train high school students
in the theory and practice of child development.
Includes a comprehensive one-year course curricu-
lum, complete with texts and audio-visual
materials.

Delivery System No. 5 -- Daily Home Assignment for School

1. Description:

Each day the child's teacher gives him a sheet which indicates his progress for that day and which assigns a task with which the parent can help. Parent can be trained both to respond appropriately to the evaluation note and/or to go over the lesson.

2. Relative Cost: Low (essentially the cost of the paper)

3. Relative Effectiveness: Not certain. Only one experiment has been done in which children did make significant improvements as a result.

4. Facilities Required: None

5. Personnel Required: Professional work would have to be done to develop the take-home sheets.

6. Materials Required:

a) Paper

b) Curriculum content of take-home sheets

7. Main Obstacles:

a) Literacy of parents

b) Social customs

c) Retraining teachers

8. Program References:

Hawkins, Robert. "Modification of Achievement by a Simple Technique Involving Parents and Teacher"

(ERIC 038684). Sheets contained only evaluative
information. Achievement improved.

Delivery System No. 6 -- Self-Instruction Materials Mailed In

1. Description:

Correspondence courses are used world wide. Advances in programmed learning can insure adequate learning if motivation and prerequisite skills exist. Materials sent need not be purely informational. Games whose instructions were written in programmed style might be delivered through the mail. Newspapers are sometimes willing to include an educational page.

2. Relative Cost: Very low for those countries with functional mail systems.

3. Relative Effectiveness: Uncertain, but probably low. The human factor is needed to make most things work.

4. Facilities Required: Central office could be used as site to prepare mailings.

5. Personnel Required: One person could serve thousands.

6. Main Obstacles:

a) Adequate public mail service

b) Prerequisite literacy skills

7. Materials Required:

a) Mail curriculum might be developed or adapted from existing texts, newspapers, magazines, etc.

b) Duplicating capacity

8. Program References:

Frank, Boris. Wisconsin Rural Family Development (064552). Supported by television and parapro visits.

Preister, Jeanne. Rural Homemaker Program (ERIC 017889) published an easy-to-read monthly newsletter which reinforced home visit sessions.

Tough, Allen. The Adult's Learning Projects. Conducted a study of persons who have developed serious and sustained self-learning projects.

Delivery System No. 7 -- Child Care Centers or Schools Attached
to Factories

1. Description:

A growing number of countries find this approach useful in (1) enlarging the work force, and (2) maintaining the family unit. Employers can and often do collaborate with Ministers of Education in such efforts. Parents who work in the factory serve for a part of the day as teacher aides, providing manpower and an opportunity to see their children. Training in child development skills helps at home as well as in the center.

2. Relative Effectiveness: This approach might provide real leverage for those interested in making rapid social change.

3. Facilities Required: Child care center can be part of or adjacent to the factory.

4. Personnel Required:

a) Teacher

b) Teacher trainer

6. Materials Required: Those found in a typical school

7. Major Obstacles:

a) Corporate cooperation

b) Social customs

8. Program References:

Spiro. The Kibbutz.

Fraser and Hawkins. "Chinese Education," Phi Delta
Kappan, April, 1972.

Delivery System No. 8 -- Family Hostels

1. Description:

Family units come to live-in, work-in centers where they receive attention from "family social workers" and engage in productive work (e.g., farming) for part of the day. The non-work program can include recreation, education, "therapy," or other activities. Length of visit can vary greatly and can be especially useful for families making the transition from rural to urban life.

2. Relative Cost: This live-in situation is beyond the means of most countries.

3. Relative Effectiveness: Uncertain

4. Facilities Required: Dormitories, etc. plus some money-making business

5. Personnel Required: Highly variable

6. Major Obstacles:

a) Financing

b) Organization

7. Materials Required: Highly variable

8. Program References:

Kulich. "Danish Folk High Schools." International Review of Education, No. 4, 1964. Discusses the way the folk school idea has been adopted in countries outside Denmark. Called "vidyepeths"

in India, the program has served as a highly effective agriculture training ground.

Schacht, Robert. "Residential Adult Education."

Unpublished doctoral dissertation, University of Wisconsin, 1957.

Delivery System No. 9 -- Parent Training at Home

1. Description:

Numerous programs train indigenous persons (usually women) to visit homes. Paraprofessionals have skills demonstrated and communicated information as effectively as professionals. The nature of the parapro-mother contact ranges widely, but most existing programs focus on improving the mother's child-rearing skills. A once or twice weekly visit has uniformly resulted in statistically significant gains in child achievement and parental attitudes.

2. Relative Cost: Since the paraprofessional/client ratio during home visitation is usually one-one, cost can be high.

Yet because of this personal attention, relatively few contacts might be sufficient to communicate skills.

3. Relative Effectiveness: See above.

4. Facilities Required: None. Schools can be used for home visitor training sessions.

5. Personnel Required:

a) Ongoing professional training

b) Paraprofessional or volunteer home visiting

6. Materials Required: Highly variable but training curriculum is a minimum requirement.

7. Major Obstacles:

a) Cost

- b) Acceptance
- c) Curriculum development

8. Program References:

"The Appalachia Preschool Education Program" (ERIC 052865). Developed clear educational objectives for a program which combined television and mobile classroom with home visits.

Archambo, Judith. "Rural Child Care Project" (055681). Childcare defined broadly to include a wide range of home-making assistance. Home visitors were intentionally non-directive.

Gordon (ERIC 056760), Weikart (046503), Levenstein (059791), Karnes (036339), and Gray (ERIC 032934). All have developed curricula for training home visitors and have specified activities for at-home sessions. Each has rigorously evaluated his program.

Jones, Elizabeth. (043587) Program did not develop any single "model" of what should constitute an appropriate home visit. Instead, the provided support and encouragement to assume the role which seemed best suited to their personality and the mothers' needs.

Tannebaum, A. J. (013852) Developed twenty-one self-contained, highly structured lesson sheets (in Spanish) which parents could easily use with first grade children.

Delivery System No. 10 -- Parent Training at a Center

1. Description:

In some areas parents are willing to travel to centers to receive training. Programs vary widely in the educational methods and objectives used; some are very directive, other simply encourage parents to share opinions, feelings and information.

2. Relative Cost: Uncertain

3. Relative Effectiveness: Good approach for dispensing materials which can then be used at home.

4. Personnel Required:

a) Facilitator

b) Professional consultant

5. Materials Required: Highly variable

6. Facilities Required:

a) School, church or other building

7. Major Obstacles:

a) Travel distance

b) Organization

8. Program References:

Gordon, Thomas. Parent Effectiveness Training.

Program which aims to improve quality of parent-child relationships.

Karnes, Merle. "Educational Intervention at Home by Mothers of Disadvantaged Infants." Mothers make toys at class sessions, then take them home to use with their children.

Parent and Child Centers (045189). Federal program providing comprehensive child care.

World Education, Inc. "Thailand Functional Literacy and Family Life Planning" (057342). Materials simultaneously teach literacy and family planning information.

Training Methods

Discussion

Selection and training of home visitors (sometimes called parent educators), while it generally has not received the degree of attention that curriculum development has, is considered by some to be the more critical determinant of program success (Weikart, 1969; Jones, 1970). According to Weikart and Jones, the key to an effective staff model is scheduling sufficient time for planning and supervision. In other terms, this means greater emphasis on in-service training. Most programs reflect this view. Pre-service training is typically completed in two or three weeks. In-service training usually occurs one day per week during the entire period of employment.

Training is more frequently done by professionals. In one program (Wisconsin Rural Family Development, 1972), the professionals spent their first year working as home visitors. This experience, combined with their academic background, prepared them to train non-professionals to serve as home visitors the following year. Although this approach is probably too expensive for most programs, it seems obvious that professional trainers should receive at least a modicum of experience doing the work of the people who they train.

Nearly all programs currently use paraprofessionals to make home visitations. Several studies (Gordon, 1969; Karnes, 1969) have found indigenous mothers to be at least as effective in communicating program information as are trained (and highly paid) professionals.

It should be mentioned, however, that some investigators have observed certain drawbacks to using paraprofessionals. Gray and Klaus (1969) found that training did not seem to make an impact until after one year of involvement in the program. Docecki (1971) recommends using a careful selection process to find workers with high motivation and basic organizational ability.

The purpose of this section is to review methods of both home visitor and parent training. Since the two are often different, they will be reviewed separately.

Training Paraprofessional Home Visitors

Programs vary greatly in the degree to which they document their training methods. In some cases training procedures are purely "in house." In others, efforts are made to publish and export their programs.

DARCEE's Early Training Project is the best example of the latter type. Their survey of the nation's state educational agencies showed a clear, expressed need for more systematic, effective training of home day-care workers. In response to this need they published a series of materials, the most important of which is the Guide for Home Visitors (Giesy, 1970). To be used by paraprofessionals during a several month pre-service training period, the Guide provides a rationale for home visiting, describes the living conditions that typify client homes and explains how these conditions affect learning, outlines the role of the home visitor, suggests specific activities

to demonstrate in the home, gives many sample cases of actual home visitations, and includes a section on ways to facilitate the parents' community involvement. Phyllis Levenstein's (1971) Toy Demonstrator VISIT Handbook, Champagne and Goldman's (1972) Teaching Parents Teaching, and Filep's Sesame Street Viewing Volunteers Training Manual are other examples of well written, thoroughly tested training materials.

Other programs have used new technologies in their training efforts. Gordon (1970), for example, found microteaching to be particularly effective in teaching specific ways to demonstrate the use of toys. World Education, Inc. (1971) has developed a twenty-five frame programmed training manual which allows non-professionals to teach themselves how to use certain literacy materials.

Training Parents

The locus of parent training varies among the different programs. While most work with parents at home, a growing number are finding it beneficial to combine group meetings with the individual, at-home sessions.

Modelling or demonstration is the most frequently used technique in home lessons. The parent observes as the home visitor actually plays with the child for ten to twenty minutes. The home visitor then encourages the parent to follow her example and use the toy or game which is provided.

A greater variety of methods are found in parent classes. One of the most effective has been group discussion. Hereford (1959) found that using peer status moderators greatly facilitated the free flow of ideas and feelings among parent participants. The use of "experts" as moderators tended to inhibit honest expression of needs and problems. Despite the fact that no outside content was injected in the peer led groups, significant changes in child rearing attitudes and behavior occurred (Hereford, 1959; Stern, 1970). While the lecture-question-answer paradigm is used in some programs, Wittes and Radin (1969) found that an activity or behavior-oriented approach was most effective in maintaining interest and changing attitudes. A typical response to this finding has been to include parents in the actual production of toys which they subsequently use at home. Film (Hanson, 1968), role playing (T. Gordon, 1967), and self-instruction (Tannebaum, 1967) are other methods which have been used effectively with parents.

C H A P T E R I V

THE QUIZ SHOW -- A NEW APPROACH TO EDUCATING FAMILIES

Chapter II highlighted the special need for developing countries to establish some inexpensive form of home-based education. The programs reviewed in the previous chapter suggest a wide range of approaches for accomplishing this. Upon assessing the feasibility of implementing the various delivery system alternatives, it became apparent to this author that radio possibly has the greatest potential for reaching and assisting families in poor countries.

Transistor radios are now being produced at a cost which most rural dwellers can afford. Indeed, many developing parts of the world are already well-stocked with pocket radios.

Although a variety of radio school programs have been in operation for years, only a small portion of the total population has benefited from the educational potential of radio. This situation will probably remain unchanged so long as government planners equate education with organization. Mass education, if approached through formal systems, will not arrive in many areas for decades.

Therefore, one way to both go beyond the previous work in home-based education and satisfy the needs of rural dwellers is to design educational radio programming that can reach large numbers of people

who may be disinclined to organize themselves for an educational activity, but who, nonetheless, have identifiable information needs. Since entertainment formats have broad, intrinsic appeal, they appear to be a natural way of reaching such an "organized" audience.

At least two questions arise. First, what entertainment formats have the potential for communicating substantial amounts of information? Second, will people learn as much from them as they would from more conventional formats such as lectures and discussions?

Since formats vary in the capacity to transmit information, we need to identify those which are best-suited to the task. Drama and music, while especially effective at reinforcing a single concept or theme, would seem strained and unnatural if scripts or lyrics were packed with too many facts. Comedy routines, since they are comprised of a series of brief and unrelated modules, might be adapted to educational purposes, yet the creativity required to design a show on a given topic is rare. The quiz show, a format with inherent information transmission characteristics, has greater potential for combining entertainment and education. Currently, the information communicated on quiz shows is either esoteric or trivial. Conceivably, however, a show could be created which maintained a high level of excitement, but which presented useful information in a coherent way. The process of creating and testing such a quiz show is the main topic of this chapter.

We are assuming that parents' information needs vis-a-vis the

rearing of their children could be effectively met through a variety of methods. Book sales, parent courses, and home visitation programs indicate the thirst that many parents have for any information related to their child's development. A radio quiz show might be well suited to provide information to a home-based audience. A format is provided here to demonstrate this idea.

Designing the Show

Criteria for Success

To be pedagogically sound, a quiz show must meet certain criteria which may or may not be fulfilled in the format, rules, and production techniques of commercial shows currently being aired.

Repetition is not a common feature of commercial shows. A program that is used as a teaching tool, however, must build in a strategy of repeating the information being "taught." When a fact is given a second time, it should be presented in a different context. Since quiz programs often have several phases where the rules change or the stakes go up, this should not be difficult to arrange.

An effective show should contain varied auditory stimulation. In addition to the voices of the contestants and moderator, buzzers, bells, music and applause serve to maintain a high level of listener attention. There must be both predictable and unpredictable sound patterns. The predictable patterns serve as cues that help the listener organize information. For example, a certain buzzer should

consistently indicate a wrong answer, while the sound of a different device should invariably mean that a right answer was given. The right level of unpredictable sounds adds an element of surprise and excitement.

As a general rule, an educational program should use contestants with whom the target audience can identify. Paradoxically, celebrities make good substitutes.

The educational quiz program probably need not be explicit about its goals. The excitement created by competition, prizes, fast pacing, and music should be sufficient to attract an audience. If there is a choice to be made, Hollywood directors rather than educators ought to be making the shows. The first goal should be entertainment; this will insure that the educational goals are achieved.

Pre-Production Creativity

If an educator is the only one available to make the show, he would do well to carefully watch the programs which currently flood the morning television schedule.

As a preliminary step to designing his show, the present author spent three days analyzing "The Wizard of Odds," "Gambit," "Baffle," "Hollywood Squares," "Joker's Wild," "The \$10,000 Pyramid," "Jeopardy," "The Who, What and Where Game," "Split Second," and "Three on a Match." Viewed from a production standpoint, the shows are awesome. Their gadgetry, timing, sound effects and sound mixing,

suspense, and surprise could hardly be reproduced by amateurs even if they had all the equipment. Certain elements, however, could be applied by novices with little difficulty. Game rules, for example, which are critical to a show's success and which are often ingenious, can be copied easily.

A comforting discovery was that the shows are not all mindless exhibitions of materialism. A number of shows challenge the best educated segment of society, and these rely very little on prize money for their appeal. Conversely, programs whose contestants win by luck and guessing depend on big prizes to attract an audience.

A number of factors account for the long-standing popularity of quiz programs. In addition to the excitement generated by competition and prizes, most shows are laced with humor, fast pacing, time pressures, challenging questions or problems, music, glamor and pizzaz.

The more popular shows have a play-it-at-home board game which can be purchased in department stores. An educational quiz program would certainly want to design such a complementary material.

Format

The final version of the author's quiz program is a synthesis of several commercial formats and some original ideas (see Appendix A-1). It is comprised of two rounds, each followed by a "Memory Minute" in which one contestant has the opportunity to win bonus points by

recalling facts given in the round just completed. In Round 2 both the "opening" questions (multiple-choice type) and the "bonus" questions (true-false type) double their value. The format is quite simple and was chosen for its efficient use of time; in the twenty-minute show, sixty questions are asked and answered.

The rules do not give contestants any choice as to which questions they are asked. Questions are presented in a pre-determined order--a constraint necessitated by experimental conditions described later in this chapter.

Program Content

Child health and nutrition content was chosen for several reasons. Besides being a subject about which much objective information is known, it is a high priority topic in developing countries and is often taught by radio. All too often, however, this material is presented in dry ways--whether over radio or in print.

The source for quiz questions and answers was Benjamin Spock's Baby and Child Care (Pocket Books, 1968). Facts were selected which seemed at once useful and little known (see Appendix A-2 for a list of questions used in the show).

After formulating questions based on about seventy bits of information, the author recruited volunteers whom he would quiz with the question list. During pre-testing, questions that were ambiguous, esoteric or too easy were revised or eliminated. The questions were

then organized to fit the quiz show format, and thus became the major part of the moderator's script.

Sound Effects and Selection of Moderator

As mentioned earlier, it is virtually impossible for an amateur to produce a quiz program that can compete with a commercial broadcast in terms of polish and technical sophistication. Since the television shows have set a standard for quality, a student producer's attempt to fool an audience into thinking that his home-made show was a recording of a "real" quiz program would surely fail. Consequently, the author made no pretenses about the show he produced. For example, there were no prizes awarded (although contestants earned "points" that accumulated by the hundreds, simulating the dollar winnings on commercial shows). In addition, contestants were local people and they identified themselves as such.

On the other hand, many of the elements one would expect in a professional program were present. Most importantly, a moderator was selected whose voice and manner were nearly professional. Also, there were electric buzzers for each contestant, a tick-tock sound in the background during the "Memory Minute," a triangle to signal the end of the two rounds, intro and outro music, and recorded applause at the beginning. Most people, therefore, after hearing the show commented that it was quite "realistic," meaning that it compared favorably to commercial shows.

Program Script

After numerous revisions in content and form were made, a script was written which was used by the moderator and the sound director (see Appendix A-1). The contestants participated without any preparation and did not use the program script during the show. The only aspect of contestant behavior which was contrived took place during the "Memory Minute." Here contestants were given a list of key words which would help them to recall facts for which they would receive bonus points. The audience did not know that the contestant had this advantage.

Producing the Show

Setting and Equipment

The final staging and taping of the show was done at the Media Center Studio, School of Education, University of Massachusetts. Four microphones were used--a lavalier type for each of the three contestants and a stand-up type for the moderator. Certain sound effects, including the buzzers, the metronome, and the triangle, were recorded directly through these microphones. Others, including the music and applause, had been pre-recorded and were dubbed onto the master tape. The show, therefore, was done completely in the studio. Some things were edited out later, but nothing was added.

In addition to the contestants and the moderator, two persons played support roles in the production. One of these served as an

assistant announcer, as the scorekeeper, and as the live sound effects man responsible for the triangle and metronome. The other worked in the control room as the sound director. Besides monitoring sound levels, he also dubbed in the pre-recorded sound effects.

Practice Taping

During the second week in June, it appeared that all the various program components were ready for a complete run through under studio conditions. Three School of Education secretaries were selected as contestants for the practice taping. The trial show ran fairly smoothly, but the need for a number of changes became apparent upon listening to the tape. The most significant weakness that we observed was the lack of adequate reinforcement and repetition of the facts being communicated through the questions and answers. Consequently, two things were done. First, the moderator's script was changed to include some additional comments. For example, after he asked the true-false question, "Older children on the average contract fewer colds than do younger children," and the contestant responded, "True," he would do more than just say "Right." His script would direct him to say, "Right. Older children are generally healthier." The second change we made was to get more coordination between the moderator's reinforcing comments and the items given during the "Memory Minute." This means that the "MM" contestant would be given a list of key words which referred to questions for which the

moderator had not been directed to give reinforcement (see Appendix A-3). The two "Memory Minutes" therefore complemented the moderator's Round 1 and Round 2 responses.

Final Taping

The final taping was done on June 17. At that time, the original sound director could not be present, but another Media Center employee filled in easily. Of course, to maintain the show's spontaneity we needed to recruit a new contestant trio. A School of Education student, secretary and teacher each volunteered to help us. They were not chosen because of any special talent or quality. Our only criteria were that they be somewhat eager to participate and that they not all be of the same sex.

Editing

During the actual taping, there were several occasions when someone would make a mistake that obviously could not be included in the final version of the tape. When such a thing happened, everyone would stop, re-orient themselves, and begin again. Later on, the author had to use his aesthetic judgment in making deletions of extraneous material that detracted from the overall effect. Of course, nothing of substance was removed. Also, leaving in a number of awkward sections had the effect of making the show seem as spontaneous and uncontrived as it actually was. These segments also added an element of humor.

The edited version of the show, like the original, was on reel-to-reel tape. For ease in later use, it was transferred to cassette. Four copies were made.

The Experiment

Research Design

There are two questions about the quiz show which the present study proposes to answer. First, can the show effectively impart new information to a given audience. Second, how does the quiz format compare to more conventional information transmission formats such as the lecture. Answering the first question simply involves presenting the program to an audience and testing their knowledge of program content afterward. The similar testing of a control group who had not listened to the show could establish what a typical quiz group knew before being exposed to the taped program.

Answering the second question involves writing and taping a lecture which communicates the same information as the quiz program. This task was undertaken by the author and will be described here.

While facts on a quiz program need not be related to one another, the facts in a coherent lecture must flow in logical sequence. Accordingly, the quiz program questions that related to a give subtopic of child health and nutrition (e.g., "vitamins") were organized in clusters. Sentences were written to clarify the relationship of the facts within a cluster. Transition statements related a given

cluster of facts to the succeeding cluster. An introductory section defined a general context in which the various clusters became meaningful. The result of all this was a thirteen-page lecture text (see Appendix B-1) which paralleled the quiz show in terms of the information it conveyed.

To tape record this lecture we selected a young man with radio broadcasting experience. He spoke clearly and distinctly. His level of animation was average. The taped lecture was equal in length to the quiz program--twenty minutes.

In comparing the quiz show and the lecture, the following hypotheses were made:

- (1) After listening to either the quiz show or the lecture, subjects will score significantly higher on a test based on the facts common to each presentation than will a control group who are not exposed to either the quiz show or the lecture.
- (2) The quiz show group will score higher on the test described above than will the lecture group.

Pre-experimental testing showed that even the best-educated persons rarely answered correctly more than sixty percent of the questions. In other words, there were a large number of relatively little known facts on the test, leaving a good deal of room for either the lecture or quiz show to have an effect. We assumed that when subjects were asked to listen to one tape or the other they would give some degree of attention to it.

Our rationale for postulating the second hypothesis is based on the key role that attention would play in determining the scores of each subject. We propose that the quiz show features described earlier such as varied auditory stimulation, competition, suspense and audience involvement due to identification with the contestants make it superior to the lecture in its power to hold the attention of listeners.

Procedure

The experiment was conducted during the week of June 24. Two-thirds of the subjects participated on Tuesday, June 25. The remaining subjects were tested on the following three days of that week.

During the previous week, teachers of University summer session courses were contacted and asked if they would be willing to use thirty minutes of class time for the experiment. Since June 25 was the first day of the summer session, most teachers were not planning to use the whole class period. Therefore, all but two of the teachers contacted responded affirmatively. The 120 subjects were mainly undergraduates. The nine teachers who volunteered their students were from the psychology, public health, human development and education departments.

In one case students were given the option of not participating; two chose not to. In the other classes the teacher simply announced that the experiment would be conducted, and, since it was part of

the scheduled class time, most students probably did not consider that they could have opted not to participate.

To each cooperating teacher was given a sheet (see Appendix B-3) which he or she read to the class. That announcement introduced the experimenter and described briefly the purpose and requirements of the "study," as it was called. Next, the experimenter described the experiment to the class according to a written script that he had memorized (see Appendix B-2). He explained that the goal of the study was to compare the effectiveness of different ways of presenting the same information, but he did not explicitly say that a test would be given after listening to the tapes.

Subjects were randomly assigned to three sub-groups (two treatments and a control). Each was taken to a different room. Since class sizes ranged from nine to thirty, sub-group sizes ranged from three to ten.

In turn, the experimenter gave listening instructions to each of the treatment groups (quiz show and lecture)--(see Appendix B-2). Instructions for taking the paper-and-pencil test were given to the control group (see Appendix B-2). When the quiz and lecture groups had finished listening to their respective tapes, they were given the same instructions for the paper-and-pencil test as was the control group. The experiment was completed for a given class when each subject's test paper had been collected.

Results

The data used in the analysis of the results are the number of correct answers given by each subject on the paper-and-pencil test. The raw scores are presented in Appendix C-1, and are summarized in Table A below.

TABLE A

Summary Statistics of Subjects Exposed to
Different Presentation Formats

GROUP	n	\bar{x} (%)	\bar{x} (raw scores)	sd
Quiz Show	40	90%	54	4.8
Lecture	40	80%	48	6.8
Control	40	57%	34	4.3

A one-way analysis of variance (see Appendix C-2) yielded an F-value of 150.9 with 78 degrees of freedom, indicating that the difference between the groups was significant at the .001 level. Groups were compared to each other by t-tests (see Appendix C-3). The results of this analysis are shown in Table B.

TABLE B

t Values for Comparisons Among
Treatment and Control Groups

COMPARISON	t	P VALUE
QUIZ VS. LECTURE	3.97	<.001
QUIZ VS. CONTROL	19.56	<.001
LECTURE VS. CONTROL	11.34	<.001

All comparisons are significant at a very high level, confirming both of our original hypotheses.

The highest score achieved by any subject within the lecture and quiz show groups respectively was 58 (out of a possible 60), indicating that both presentations had the same potential for raising scores. On the average, however, it appears that the quiz show was significantly better able to hold the attention of listeners.

Discussion

In this section we will discuss the meaning of the results and propose some explanations for the experiment's success.

As predicted, the control group scores were sufficiently low (57%) to allow the subjects in the treatment groups to show a large

gain. That the quiz group could score as highly as it did (90%), however, requires some explanation. In general, it seems conceivable that some facts would not be received and stored as well as others. A determining factor might be the degree to which a person possesses background knowledge related to the topic. In other words, the more removed are the facts from a person's experience, the less likely it is that he will be able to retain them. Applying this principle to the present experiment explains the high quiz group scores in that most people generally know about milk, babies, vitamins, diets, cooking, illness and so on. When presented with new information on these topics, people could easily absorb it. Since many of the facts were chosen specifically because they contradicted commonly held myths (e.g., rust causes tetanus), we were certain that the listeners already had a frame of reference relative to those questions.

The experimentally indicated difference between the teaching efficacy of the quiz show and the lecture should be accepted with caution for the following reasons. First, there is no way of assessing the quality of each presentation in comparison to others within its own genre. We do not know for sure if we have compared a good lecture with a bad quiz show or vice versa. A partial solution to this problem is to exercise judgment, however subjective it may be, in evaluating the quality of the particular lecturer's reading of the material with what one can imagine as the best possible rendering of the same material; the same evaluation could be done with the quiz

show. In the opinion of this author, there was more room for improvement in the quiz show than in the lecture.

Another possible objective to the results might be that the form of the test bore greater similarity to the quiz show form of presentation than to the lecture. Countering this, however, is the fact that a substantial number of subjects in the lecture group scored as high as the highest quiz show subjects. It seems, therefore, that the amount of attention was the factor which determined a subject's score.

Of course, it should be mentioned that the experiment measured short-term recall; tests were distributed immediately after the subjects finished listening to the tape. We have no way of knowing whether the comparative scores would change if long-term retention were measured instead. A future study might investigate this question.

Another issue which the experiment's design masked is the extent to which subjects received new information which they could retrieve for a test, but which they could not apply in another setting. It seems that a person's background knowledge would be the critical factor in applying new information. It is probably true that a lecture could better establish the conceptual framework required to make useful a new fact.

Future Research

In the literature on radio and television the author found no studies on the educational potential of quiz shows. Furthermore, there are very few studies which analyze the teaching efficacy of production and program variables (e.g., humor) which comprise quiz shows. Hence, the need for additional research is great.

In respect to production variables, we need to know much more about such things as relative importance of sound quality and variety of auditory stimulation. Is there a point beyond which the addition of various sound effects detracts from a show's capacity to teach? Is there an optimum combination of buzzers and bells? How important is the moderator's role? Can a show using a non-professional moderator be as effective as one that uses a professional?

The study raises many issues about program variables. First, research should be conducted to compare the effectiveness of different quiz formats. Next, certain formats might be better suited for some kinds of information than for others. Finally, we need to know if the excitement created by prizes is needed to attract an audience.

How quiz shows affect different types of audiences is another area for future research. Will parents learn more from listening to programs in groups rather than individually? Can people learn as much when listening in large groups as in small groups? Would educational quiz shows be effective with persons who have not been

exposed to commercial quiz programs? Would quiz shows be effective in cultures which are oriented toward cooperation rather than competition? What other personality or experiential prerequisites are therefore receptive to quiz shows?

The relationship between quiz show content and listener retention is a fourth area for study. How much background knowledge is required before a listener can absorb the isolated facts which are communicated through the quiz questions and answers? Are some types of information more likely to be retained and applied than others? Can some types of programs be more easily adapted to home games than others? Can quiz shows communicate attitudes as well as they communicate facts? The study reported here shows that child health and nutrition information can be retained in the short term; would the same be true of the long term?

Finally, there are a host of general questions which require investigation. First, how much would the addition of a complementary home game increase the effectiveness of the radio presentation? Can quiz shows be produced for the classroom? If so, knowing the effects on contestants would become important. Would quiz shows be more effective as but one component in course of study? Would they be as cost-effective in such a structured context as in a system where people choose whether or not to tune in to the shows? In sum, future research will have to explore the feasibility, efficacy and appropriateness of the educational quiz show.

Implications for Education

If it is true that quiz shows are effective transmitters of information, what are the implications of this for those working in both formal and non-formal education?

First, we should discuss what quiz shows can and cannot do. They are certainly best-suited for transmitting hard, objective facts. The author has seen few programs which deal in abstract concepts and principles. ("What's My Line?" may be a notable exception.) New facts will be readily received and probably applied if the listener has an adequate conceptual framework into which he can integrate the new information. Hence, quiz shows might be good as summaries or reviews for certain courses of study. They might also effectively give up-to-date facts on things that are constantly changing such as farm prices.

Another potentially fruitful use for quiz shows is in the area of literacy and vocabulary development. A number of on-going television games including "Password," "Baffle," and "The \$10,000 Pyramid" are good examples of what can be done to make words and letters a source of excitement.

Although there are no cost figures available, it seems that a quiz show would be more expensive to produce than a relatively straight-forward presentation such as a panel discussion. This may partly explain why such things as public health programs are often so dull. At what point then is it worth the effort and money to

produce quiz shows? While no simple answer exists, it seems clear that entertainment formats make more sense as the scale of distribution increases. If a quiz show can attract a twenty percent larger audience and impart information ten percent more effectively, then it may be able to pay for itself.

In general, quiz shows could bring life into many educational programs. The lecture format, unfortunately, is both boring and pervasive. A number of lecture group subjects in our experiment expressed dissatisfaction at having to listen to such dry information. We did not hear any such comments from the group who received the same "dry information" via the quiz show. Since an exciting quiz show can be produced with relatively little prior experience, educators ought to explore the uses of this powerful technique.

Conclusion

Implicit in the foregoing analysis is the view that home-based education can benefit both the individual and society. In this concluding section, we will consider the conditions under which a salutary effect can be ensured.

Probably the most critical pre-condition for the success of family education is the willingness of parents to participate. Respecting the individual's right to privacy should be a sufficient rationale for serving only those who enroll voluntarily. A more pragmatic reason is the difficulty of achieving success with an

unwilling, captive audience. Since home-based education has not traditionally been imposed on anyone, this principle of voluntarism is even more applicable. Ideally, home-based programs should exist as one of many routes to learning for families.

The concept of free choice has implications for another issue; namely, the effect of home-based education on the status of women. Requiring participation in home-based programs would entrench the stereotype of the woman's role being in the home--a situation which is clearly antithetical to the needs of many, if not most women. On the other hand, family education could train those parents who wish to stay home to be effective educators of their children.

By identifying skills which distinguish effective parent-educators, home-based programs could enhance the prestige of parenthood. If not disseminated and packaged carefully, however, "parenting" science could be viewed by the public as "mothering" science. The consequences of this could be to pressure less-than-willing mothers to stay at home. On the other hand, it could bring greater self-esteem to those women or men who decide to make parenthood their full-time job. Hopefully, calling attention to the human costs and benefits of rearing children would induce more men to participate actively in this endeavor.

As they are currently organized, most home-based programs appear to strengthen the traditional family. What is the significance of this for the larger society? Of course, no simple answer exists.

Some commentators view the family as a conservative force and believe that only formal education can reform civilization. Others, however, feel that the family can be the source of both stability and progress. China, for example, encourages families to develop the techniques of self-criticism. By using Mao's principles at home, parents learn to equitably assign domestic tasks such as child-rearing.

Finally, what is or should be the relationship between home-based programs and the formal education system? Presently, most home programs train parents so as to increase the chances that children will succeed in school. One would, therefore, expect a critic of the school system's objectives to be a critic of home-based education. A sensible way to both enhance the value of family education and preclude criticism related to the narrow, cognitive orientation of schools is to strengthen the capacity of home programs to teach affective skills. In this way, the non-formal, family education could complement the formal system.

APPENDIX A

Quiz Show Production Materials

1. Master Script
2. Moderator's Questions and Answers
3. "Memory Minute" Sheets

(Sound director's cues in CAPS)

THEME MUSIC BEGINS

MUSIC VOLUME DECREASES when asst. announcer says:

"Today contestants match their knowledge of child health and nutrition for big prizes. The star of our show has the answers, and here he is, Mike Evans!
(APPLAUSE BEGINS)

"Hi everybody. (MUSIC STOPS here and APPLAUSE FADES)

"Thank you and welcome to the Real World Quiz Show, where real world knowledge brings some unreal prizes. We'll tell you about those a little later.

"let's get started by meeting our contestants. First we have a teacher from Springfield, (Name).
(APPLAUSE and some response from the contestant)

"Next we have a student from Amherst, (name).
(APPLAUSE)

"Finally, we have a radio technician from Montague, (name).
(APPLAUSE)

"Now players, the rules are simple. In Round 1 when I ask a question, the person who responds first and answers correctly, gets 25 points. That person is then eligible for a bonus question worth 50 points. When Round 1 is over, you'll hear this sound -- (MC rings triangle). Whoever has the fewest points then has a chance to catch up by recalling as many of our quiz answers as they can in 60 seconds. So while we're playing, try to remember our questions and answers, because you may need to recall them later in the show during our Memory Minute.

MC explains that the source for our answers is the Encyclopedia Brittanica.

"Players, are you ready?" "First let's see if our answer buzzers are working properly."

MC asks each contestant in turn to sound his buzzer.

"OK, let's begin."

MC proceeds with Round 1 questions and answers.

MC disqualifies a respondent if he takes too long in answering the question. He then gives one of the other contestants a crack at it if one of them buzzes.

When one person gives a wrong answer to an introduction question (i.e. not a bonus question), the moderator says "Wrong" and then gives the other contestants a chance to answer it.

MC should read the supplementary remarks which are found after most of the questions. These remarks are hand-written on the question sheet.

After the last question in Round 1, the triangle sounds. (MUSIC AND APPLAUSE BEGIN SIMULTANEOUSLY)

(MUSIC CONTINUES) (APPLAUSE CONTINUES)
"All right players, that marks the end of Round 1."

(MUSIC AND APPLAUSE FADE OUT near the end of the above sentence)

"Now let's look at the scores.
"(Name) has _____" (# of pts--lowest person first)
"(Name) has _____" (# of pts--middle person next)
"(Name) has _____" (# of pts--highest person last)

(APPLAUSE and music, if possible -- very brief)

"(Name) has the fewest points, but he/she can catch up in our "Memory Minute"

"Now, (name of low-point person), you will have 60 seconds to recall any or all of the answers that were given in Round 1." (they must be put in sentence form)
"For each correct fact that you recall you'll receive 25 points. You'll hear this sound (triangle or bell) every time our judges accept your response.
Are you ready?"

"All right, begin." (tick tock in background)

At the end of 60 seconds the triangle rings, the tick-tock stops and the MC announces the number of points the person has won. (APPLAUSE)

MC reviews scores. (APPLAUSE at end of review)

MC announces Round 2 where:

- a. opening questions are worth 50 points;
- b. bonus questions are worth 100 points;
- c. there will be another "Memory Minute."

"At the end of Round 2 we'll know who today's winner will be. That person will receive some very nice prizes. Jim Thomas, tell us about it."

Asst. announcer ("Jim Thomas") says:

(MUSICAL BACKGROUND)

"Today our prizes are just what the beginning family needs. First, our winner and his family will receive one full year of medical treatment at the University Health Service. In addition, he or she will have 9 months' free tuition at the Pioneer Valley Child Care Center. And finally, for the youngsters we have a choice of 10 toys from the Child's World Toy Store."
(APPLAUSE)

"OK, contestants, that's what we're playing for. Good luck to you all in Round 2."

Round 2 questions and answers proceed in the same fashion as Round 1. At some point near the end, however, the MC may wish to quickly summarize the scores. (especially if it's a close match.)

After the final Round 2 question, the triangle rings. (MUSIC AND APPLAUSE begin while it is ringing.)

MC reviews scores. He identifies the low-point person who then gets a chance to catch up in the "Memory Minute" where each fact is worth 100 points.

(tick-tock during Memory Minute. bell sounds for each correct fact)

MC announces the number of points that the Memory Minute player won.
(APPLAUSE)

MC reviews scores of all three players
and announces winner.
(APPLAUSE AND MUSIC)

MC says that the winner has earned the right
to return and compete on next week's show.

MC says he hopes that everyone enjoyed the show
and would tune in next week for the "Real World Quiz Show."

"Good-bye"

(APPLAUSE AND MUSIC BEGIN SIMULTANEOUSLY and continue
in background while the asst. announcer says:

"Today's contestants will each receive
"a year's supply of Gleem toothpaste compliments
of Cannon's Pharmacy;

"a quart of milk a day for the next 6 months
from Cumberland Farms; and

"a basket of fruits and jellies from Atkins
Fruit Bowl."

"This has been University Media Program production."

(MUSIC AND APPLAUSE FADE OUT)

QUIZ QUESTIONS ON CHILD HEALTH AND NUTRITION

Appendix A-2: Moderator's Questions and Answers Script

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1. For what part of the body is vitamin D of particular importance?
 a) skin b) bones c) brain d) liver

T/F Yes, Vitamin D is important for bone development.
 A cereal in baked form is just as nutritious as one that has been boiled.

2. Which of the following vitamins are usually deficient in both cow's and mother's milk?

1) vit. B 2) vit. C 3) vit. D 4) vit. E

T/F Now I know why vitamin D is added to milk.
 Babies naturally prefer fresh milk over evaporated milk.
 Babies accept both equally.

3. Which of the following foods contains the least amount of vitamin C?

1) tomatoes 2) potatoes 3) cabbage 4) lemons

T/F Potatoes contain very little vitamin C.
 Frozen foods are more easily digested than are fresh foods.

4. Direct sunlight can produce which vitamin in the skin?

1) vit. A 2) vit. B 3) vit. C 4) vit. D

T/F Sunshine Vitamin D
 Nursing mothers can usually continue to eat all the foods they are accustomed to eating.

5. Which of the following vitamins is destroyed by 180 degree heat?

1) vit. A 2) vit. B 3) vit. C 4) vit. D

T/F So don't boil your orange juice.
 Excessive doses of vitamin D are not harmful.

6. What does boiling do to the digestibility of a baby's formula?

1) increases digestibility 2) decreases digestibility
 3) has no effect So boiling does more than just kill germs.

T/F Evaporated milk is more expensive than fresh milk.
 Evaporated milk, in fact, is less expensive.

7. What is the amount of milk often recommended for nursing mothers to drink daily?

a) 1 quart b) none c) 2 quarts

T/F One quart is right.
 Fresh milk is more nutritious than evaporated milk.
 They are equally nutritious.

8. Which of the following amounts of formula are what an average 8-pound baby will consume in 24 hours?

a) 12 oz. b) 28 oz. c) 42 oz.

T/F Fresh milk is less apt to cause allergies than is evaporated milk.
 Fresh milk is more apt to cause allergies.

9. Which of the following elements cause hardness of the bones and teeth?

1) iodine and vitamin B 2) zinc and marrow 3) calcium and phosphorus

T/F Lactic-acid milk is more easily digested by some babies than is ordinary sweet milk.

10. Which of the following is the best source of calcium and phosphorus?
 1) cereals 2) milk products 3) vegetables

T/F Prolonged cooking of vegetables in a lot of water can remove minerals from the vegetables.

11. How many ounces of ordinary cheese are required to provide an equivalent amount of calcium found in 8 oz. of milk?
 a) 1 oz. b) 3 oz. c) 6 oz. d) 8 oz.

1 oz. of cheese equals 8 oz. of milk

T/F The more thoroughly ripe a piece of fruit, the harder it is for a child to digest. *Ripe fruit is easier to digest*

12. How many ounces of cottage cheese are required to provide an equivalent amount of calcium found in 8 oz. of milk?
 a) 1 oz. b) 3oz. c) 6 oz. d) 8 oz.

T/F An uncooked cereal has the same food value as a cooked or hot cereal.

13. Which of the following foods contain the complete variety of proteins which the human body needs?
 1) fruits 2) eggs 3) vegetables 4) grains

T/F Fish contains the complete variety of proteins.

14. What percent of a baby's body weight is water?
 1) 50% 2) 60% 3) 75% 4) 90%

T/F Water contains no vitamins or calories. *60% of baby is water*

15. Starches are composed of chemical combinations of what kind of material?
 1) vitamins 2) proteins 3) sugars 4) minerals

T/F After a frozen food has thawed, it spoils more easily than does a fresh food.

16. Which of the following foods has the most calories per ounce?
 1) potatoes 2) sugar 3) butter 4) margarine

T/F Most foods are composed largely of water. *watch out for butter, weight-watchers.*

1. What is the average number of colds that children between 2 and 6 contract in a typical year?
a) 2 b) 4 c) 7 d) 10

2. T/F A normal newborn baby has more resistance to cold germs than his mother or father.
7 colds a year

2. A majority of illnesses among babies show the first symptoms during the
1) morning 2) afternoon 3) evening
Infants do have more resistance.

T/F Most babies cannot breathe through their mouths.

3. What does adding moisture to a room with dry air do for a cold or cough? Does it ...
1) help the cold 2) prolong it 3) or have no effect

T/F Older children on the average contract more colds than do younger children.
Older children are usually healthier

4. Which of the following meats can be especially dangerous if it is not cooked long enough?
a) chicken b) hamburger c) pork d) fish

T/F Many babies have natural protection against measles during their first 6 months of life.
Yes, they are protected.

5. Which of the following characteristics of a rusty nail has the potential of causing tetanus when a child is cut by one?
1) rust 2) iron 3) germs
It's a myth that rust causes tetanus.

T/F No vaccine is available to prevent measles.
Fortunately, we do have a measles vaccine.

6. At what age is the average baby about over his tendency to have colic?
a) <3 months b) 9 months c) 15 months

T/F Cow's milk is more likely to cause colic than breast milk.
Both cause colic

7. Which of the following is the most common symptom of allergy in babies?
1) fever 2) eczema 3) diarrhea

T/F The tonsils of most children should be removed.

8. Which of the following foods are a common cause of allergy?
1) carrots 2) sugar 3) eggs

T/F The older a baby is when he receives a new food, the less likely he is to develop an allergy to it.

9. Which of the following grains are most likely to cause allergy?
 1) corn 2) wheat 3) rice 4) oats

T/F) A healthy baby's body temperature should never vary from 98.6 degrees. We'll see more about this in the next question.

10. By how many degrees can a child's body temperature rise as a result of vigorous activity?
 a) 1 degree b) 2 degrees c) 3 degrees

T/F) When a child has a fever, you should force him to drink as much fluid as possible. The more the better. *After a certain point, more fluid won't help.*

11. About how long does it take for a mouth thermometer to register the correct temperature of a child's body?
 a) $\frac{1}{2}$ minute b) 2 minutes c) 5 minutes

T/F) When a child has fever, you should strongly encourage him to eat, even if he does not want to.

12. Zinc ointment is used primarily to protect against:
 1) allergies 2) diaper rash 3) poison ivy

T/F) Waterproof diaper pants increase the likelihood of diaper rash.

13. Which of the following things are necessary to the growth of acid-producing bacteria which cause tooth decay?
 1) sugar 2) starches 3) saliva 4) all of these

T/F) Parents need not worry about tooth decay in the child's first set of teeth because they will be replaced by another set.

14. Which of the following chemicals is known to be helpful in the formation of teeth and in preventing tooth decay?
 1) iodine 2) iron 3) flouride 4) all of these

both decay can lead to gum infection.
You've heard about those flouride toothpastes.

If a child has a high fever (104 or greater), how should he be cared for?

- 1) light covers in a room at ordinary temperature
 2) heavy covers in a warmer-than-usual room

Appendix A-3
"Memory Minute" Clues

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(Round 1)

vitamin D bones

baked cereal = boiled cereal

milk-deficient-vitamin D

digestibility-frozen foods

sun-skin-vitamin D

boiling-destroy-vitamin C

boiling makes milk more digestible

ripe fruit is more digestible

eggs-complete variety proteins

baby's weight-60% water

starches are made of sugars

most foods-mostly water

(Round 2)

7 colds/year (2-6 yr. olds)

older children-fewer colds

germs-tetanus (not rust)

allergies cause eczema

eggs-allergy, common

fluid-fever

diaper pants(waterproof) increase chance of diaper rash

fluoride-tooth decay

first symptoms most illnesses--afternoon

Wheat-grain most likely to cause allergy

vigorous activity-1 degree temperature rise

APPENDIX B

Comparison Test Materials

1. Lecture Text
2. Experimenter Instructions
3. Cooperating Teacher's Announcement
4. Sample Test

Today we want to discuss some things about your child's health and nutrition. Some of the facts ^{we'll discuss} I'll present will surprise you. Others are included because they're so important that ^{with} they're worth repeating, ~~then is probably a good idea.~~

But before we begin, let's remember that no information ^{here is going to take the place of regular} given is ~~more useful than that given~~ during a visit to your doctor. He is the one who can tell the meaning of certain ^{symptoms} as they appear in your child. He is the one who can take a scientific approach to recommending a diet particularly suited to your child. ^{Never the less} Much of what I'll say today will help you handle problems until a doctor can be reached. So while each of us doesn't have all the knowledge of a doctor, in emergencies ^{it} we can really make a difference by knowing some basic things.

You should of course have your baby checked regularly -- most frequently during the first year and maybe 3 or 4 times during the second year. Between visits to your doctor you might find it helpful to keep a notebook in which you write questions for your doctor as they occur to you. (para cont.)

This eliminates frustration when you're in the doctor's office, and know that you have important things to ask, but can't remember all of them.

Of course, just because you take your child to visit the doctor regularly doesn't mean that he won't get sick or have problems. And, on the other hand, every baby won't get in trouble just because his doctor doesn't see him regularly. But experience has shown ^{if that doesn't} ~~that~~ a monthly visit is vitally important for the occasional baby who is not doing well, and a comforting precaution for all the rest.

In most cases the parents and the doctor soon come to know and trust each other and get along fine. But occasionally, since they are all human beings, there may be misunderstandings and tensions. Most of these are avoidable or easily cleared up with frankness on both sides.

Unless expense is no concern, it's a good idea to discuss charges when first engaging a physician. It's easier at the start than later. Though this may embarrass you, remember that it's an old story with the doctor and he should be able to take it. Many physicians will lower their fees for people with less-than-average income and are glad to know of the need ahead of time.

Most new parents are bashful in the beginning about asking questions about baby care that they are afraid are too simple or silly. It's foolish to worry about this. If there's any kind of question on your mind, you're entitled to an answer--that's what doctors are for.

Even if you feel sure that your doctor will be grumpy about something that is probably not serious but that you are nonetheless concerned about, call him anyway. Your child's health is more important than the doctor's feelings or your own feelings for that matter.

It often happens that a parent asks about a problem and the doctor explains part of it but gets sidetracked before he has answered the parent's most important question. If the ^{this happens to you} mother is ^{and you are slow to be or cautious} bashful, she may hesitate about coming back to that point and go home somewhat unsatisfied. ^{However you have the perfect right} She ^{you} should encourage herself to be bold, to make clear exactly what ^{you} she wants to know, so that the doctor can give her the answer or, if it is out of his line, refer her to some other professional person.

On today's show I hope we can answer some of those questions you've thought of but haven't yet asked. You know, this information is the most important kind we can have -- what more precious duty or responsibility is there than caring for a newborn human being.

Maybe we should start out with something we have to deal with most often -- colds. Surprisingly, a newborn baby usually has a greater resistance to cold germs than his mother or father. The whole family may have a bug, but baby remains healthy. Nature knows that colds would have a more severe effect on the baby than on his older sister and therefore has protected him from them. Did you know that a very young baby cannot breathe through his mouth? So you can imagine how serious a cold is if it plugs up the nasal passages. (para. cont.)

The mucus would have to be drained to protect the baby from suffocating.

You'll most likely see the first signs of a cold in the afternoon. We're not sure why this happens, but it's comforting to know that something can usually be done before the child goes to bed at night.

What can we do to make the child more comfortable during this time? In wintertime, it is especially helpful to increase the amount of moisture in the air in the child's room by using a humidifier. Dry air leads to dry nasal passages; overly dry nasal passages allow more germs to enter the child's system, and are a source of discomfort.

Of course the best cold remedy is rest. Plenty of sleep helps one's system rally to combat germs. Colds seem hard to prevent. ^{in fact} The average 2 to 6 year old child contracts seven colds a year. As a child grows older this number decreases. Consult your doctor if this does not occur.

Colds, while our most frequent worry, do not usually alarm us. They seem to be part of growing up. Certain other diseases and illnesses, however, must be given more careful attention.

During the first six months of a baby's life he is protected from certain contagious diseases like measles and scarlet fever— ^{that is,} if the mother has had the disease. Since such illnesses could cause death to the infant, it is quite a relief to know that he is safe, at least for a while. (para. cont.)

Fortunately, there is a vaccine for measles which can protect the baby after his natural defenses have been lost.

Certain other diseases can be prevented by exercising caution when cooking. Trichonosis, for example, can result from eating pork that is not completely cooked.

As we all ^{know} Children are often scraping and cutting themselves. A disease called tetanus was for a long time thought to be caused by rusty nails. ^{however} We now know that it's germs that cause the disease. The rust or the iron have nothing to do with the tetanus germ. The safe thing is to have your children innoculated at a very young age.

A less serious, but very distressing illness is colic. Colic is a general term that refers ⁽ⁱⁿ⁾ to intestinal gas pains. It worries many parents because the cause is unclear and, at times, there seems to be no cure. Colic occurs with breast milk, cow's milk, or formula. ^{and} There's no sure-fire way to avoid it. Fortunately, most babies are over their tendency to have colic by age 3 months.

Another problem that which is hard to explain is allergy. The skin rashes or eczema which allergies cause can only be properly diagnosed by your doctor. ^{But} What are some things we do know about allergies? First, food allergies are the most common. Eggs seem to be the most frequent offender. Among grains, children are most likely to develop allergies toward wheat. Does this mean we shouldn't introduce children to these foods? No! Consult your physician before making any such dietary restrictions.

Fortunately, it seems that children develop some resistance to allergies as they grow older. An 8 year old is less likely to become allergic to a new food than is a two year old. Also, children sometimes "outgrow" their allergies.

A common misconception that is being dispelled by ^{now} medical researchers is that most children need to have their tonsils taken out. In fact, only a small minority need such an operation. Surprisingly, recurrent tonsillitis or frequent colds are not by themselves reasons to take out tonsils.

Another common, but frequently misunderstood problem is fever. A healthy baby's body will vary from 98.6 degrees under normal circumstances. For example, vigorous physical can raise his temperature one full degree. For the same amount of activity, the younger child's temperature is affected more than ^{is} the older child's.

Sometimes parents wonder how long it takes to get an accurate thermometer reading. Two minutes is sufficient.

Let's assume that after reading the thermometer, the parent suspects his child is ill. What should ^{can we do how} he do? A very high fever means that the child should have light covers in a room of normal temperature. Some people think that the higher the temperature the more the blankets. This is not true. Another misconception is that the more fluids the child drinks, the better. While it is true that fluids are helpful, beyond a certain point, drinking more does not help. Consult your physician to determine the proper amount. In a similar way, you should not force the child to eat if he has no appetite for the food.

Before we start discussing things related to your child's diet, I want to mention two more problems which every parent must face -- tooth decay and diaper rash. Some parents think that since the child is going to lose all his "baby teeth," they need not worry about them getting cavities. This is not true. We should make every effort to avoid decay in this temporary set of teeth. What causes tooth decay anyway? Acid-producing bacteria are the culprits. They feed on sugar and starches which grow quite well in saliva. Something must be done to reduce the number of these bacteria. One way is to take away the bacteria's food by not eating as many sweets. Another way is to use drinking water or tooth pastes that contain flouride. Flouride kills many of the bacteria, and in small amounts is perfectly safe.

Now, diaper^{rash} is the other thing we want to consider. First of all, how do we prevent it. Well, of course, using sterile diapers is one way. Another thing you can do is avoid using waterproof diaper pants. But let's say that you're not fortunate enough to avoid the problem. What then? Zinc ointment is often a good remedy. Sever rash however requires a doctor's treatment.

We've been talking so far about your child's health. Now let's move to a different but related topic -- nutrition. Of course, eating the proper foods is essential for your baby's sound growth. Therefore, for some people, the first time they seriously start asking questions about nutrition is during the first pregnancy.

What things are important for a pregnant mother to know about food? We can't begin to cover everything here today. So the first step is to consult your doctor. He will have many specific recommendations. In general, however, the pregnant or nursing mother can continue to eat all the foods she is accustomed to.

First of all, let's talk about milk for the mother. One of the reasons that both pregnant and nursing mothers need milk is because their normal diets do not provide a sufficient amount of vitamin D. Since milk is a good source of this vitamin, an extra amount should be taken each day. For this and other reasons it is recommended that nursing mothers drink a quart of milk daily.

What about the mother who is bottle-feeding her infant? Your doctor will undoubtedly recommend a formula, but you might be interested to know some things about the kinds of milk that are available. Many mothers want to know whether to feed their children fresh milk or evaporated milk. What are the advantages of each? First of all, babies do not have a natural preference for either one. Both will be accepted easily when introduced. If the baby has grown accustomed to one type, however, the other may be rejected if it is given. Also, both are equally nutritious and sterile. Fresh milk has (cont.)

one disadvantage in that it is more likely to cause an allergy. Evaporated milk, therefore, is a safer bet. You might wonder about comparative costs. Surprisingly, evaporated milk is less expensive. Despite the apparent advantages of evaporated milk, it seems ^{that} mothers prefer fresh milk.

What about the preparation of the formula? An important step in the process is boiling. Not only does boiling kill germs, it also makes the milk more digestible. By the way, if your baby is having trouble with digestion, you might try using lactic-acid milk. It is more easily digested than ordinary sweet milk.

What about quantity? How does one know if the infant is drinking too little or too much? There is no simple answer to this question, but you might be interested to know that the average 8 pound baby consumes about 28 ounces in a 24 hour period. But lots of babies aren't "average." So you'd be wise to consult your physician about quantity. Among other things, he knows what weight gain can be expected and can judge the amount of formula needed to achieve a reasonable gain.

After a baby begins taking solid food, dietary planning becomes more complicated for the mother. The different possible combinations of food are endless. How is the mother to decide? Interestingly, several studies have shown that if a wide variety of foods are placed before an infant at each meal time, he will choose a balanced diet for himself. This does not mean that each meal will be balanced -- at one sitting he may eat only a single type of food. At subsequent feedings, however, nature will prompt him to fill in those kinds of food that he needs.

Most parents, however, are not going to let their baby decide on his own diet. If we are going to choose food for the baby, then we have to know about the nutritional value of foods, and we have to know what effect different vitamins, proteins, and minerals will have on our child's health.

We've already mentioned that vitamin D is deficient in breast milk. The same is true of cow's milk. This is why most milk you buy is labelled "Fortified with vitamin D." We have to be careful, however, not to overcompensate for the vitamin D deficiencies. Too much of this vitamin can be as harmful as having too little. Consult your doctor before you take vitamin D supplements. One thing more on vitamin D -- there's another way of getting it besides through foods or pills. Some of you may already know that sunlight can produce vitamin D in the skin, which is then absorbed into the body. So far, we haven't even mentioned what our bodies do with vitamin D after they get it. ^{Vitamin D's most important function} ~~Its main job~~ is to help in the development of strong bones.

Now, what are some things we should know about other vitamins? A vitamin which has been in the news a lot lately is vitamin C. Some people claim it has great powers to prevent all kinds of illnesses. We're not going to enter that debate here today -- but we can say that the human body does require vitamin C for the development of bones, teeth, and blood vessels, and plays a part in the functioning of most of the cells of the body. A disease which is caused by severe vitamin C deficiency is called scurvy. Most people know that this vitamin is found in citrus fruits, but not so many realize that it's present in many other foods as well. Tomatoes and cabbage, for example,

contain vitamin C. Even potatoes have some, although the amount is smaller than in the other foods we've mentioned. While you might be pleased to find out that vitamin C is found in many foods, there's a catch to it. Cooking at temperatures over 180 degrees destroys just about all of the vitamin C. So there are obvious advantages to including juices and raw vegetables and fruits in the diet.

Let's change the subject a bit. What are some things we should know about proteins and minerals? A great deal of interest has arisen in protein lately. Deodorants, cosmetics, shampoo, and many other non-consumable products claim to contain that magic ingredient -- protein. While we're not sure how important it is to have protein in your hand cream, for example, we are sure that protein in the diet of a growing child is a vital factor in his proper development. How can we be sure that baby is getting his daily requirement of protein?

Most natural foods contain protein -- some have a lot; some have only a little. Meat, poultry, fish, eggs, and milk are the foods richest in ^{protein} it. They are the only ones that supply "complete" proteins -- that is, they contain the complete variety of protein elements the human body needs. Vegetables, grains, and fruits, while lower ⁱⁿ protein content, supplement the child's daily protein needs, but cannot take the place of his meats, fish, eggs, and milk.

Equally important as protein are minerals. Minerals play a vital part in the structure and workings of every part of the body. The hardness of bones and teeth, for example, depends on calcium and phosphorus. These two minerals are found most plentifully in milk products. (cont.)

You might be interested to know that a single ounce of ordinary cheese contains as much calcium as an eight ounce glass of milk, while it takes 3 ounces of cottage cheese to provide the equivalent amount of calcium.

Another important mineral is iodine. Since the water and locally grown foods in inland areas are deficient in iodine, it is wise to use iodized salt. ^{But this should be up people} You can find iodized salt on any supermarket shelf.

Another important element in your child's diet is water. Did you know that fully 60% of his body weight is made up of water? Fortunately, most foods are made up largely of water, so we don't have to drink so much of it ^{in the water} "straight." Water, of course, contains no calories, even though it adds to our weight. And although it's critical to life, it contains no vitamins, it is a vital substance that we too often take for granted.

There is another kind of food which we haven't mentioned -- starches. There is a good deal of confusion about "starchy foods" as they're called. Some people think they are of no value. Although it is true that a starch is simply a chemical combination of sugars, most natural foods that contain a great deal of starch, such as bread or potatoes, also contain a certain amount of vitamins, minerals or proteins. It is the highly refined, "artificial" foods that the starch skeptics have in mind.

So far we have been discussing the way different types of food affect the functioning of our bodies. But since the value of raw food is often different from prepared food, we need to know how various preparation methods such as cooking, freezing,

and aging affect the food we eat.

To begin, we should realize that even raw foods change their composition as they age. For example, the more thoroughly ripe a piece of fruit, the easier it is to digest. Also, foods that have been frozen are more easily digested than fresh foods. As far as we know, however, freezing need not change the nutritional value of foods. Once a frozen food has been thawed, however, it is more easily spoiled than a fresh food.

Now, what about cooking? We've already mentioned the effects that heat has on vitamin C. Fortunately, heat does not destroy most other vital nutrients. Uncooked cereal, for example, has no more nutritional value than cooked or hot cereal. Also, cereal in baked form is just as nutritious is just as nutritious as cereal that has been boiled. In the case of vegetables, however, prolonged boiling can remove minerals. These minerals dissolve in the water. Some people, therefore, like to save the water in which they have cooked their vegetables.

Today I hope we've answered some questions you've had about child health and nutrition. We've touched on only a very few basic ideas. There are so many more things to know. So we hope you'll join us next week at this time for another "Discussion for Parents."

To the control group the following instructions should be given:

(Have a supply of pencils ready and mark each of the question sheets with a "C" for "control.")

"I would like this group to answer the questions on the sheet I'm going to give you." (start passing them out)

"There are two things you should notice:

"The first is that the questions alternate between multiple choice and true-false types. Each multiple choice is followed by a true-false.

"If you're disturbed by the alternation, feel free to do all of one type first and then go back and do the others on another run through.

"The second thing to notice is that there are questions on both sides of each sheet.

"Place a circle around the letter that corresponds to the item which you feel best answers the question. Do not spend too much time on any one question.

"you need not put your name on the paper."

"Please begin and do not talk until everyone is finished."

DO NOT LET CONTROL GROUP REJOIN TREATMENT GROUPS

When the treatment groups are done listening to their respective tapes, repeat the above directions for their post-treatment test.

After recruiting subjects the experimenter should say to them:

"We want to test out different ways of communicating useful information to parents.

"Even though few of you are yet parents, I think your experience today will give us some idea of the comparative effectiveness of different approaches to learning facts about child health and nutrition.

"We need to divide into three equal groups; so please count off by threes.

"Group one should go (location) .

"Group two (location) .

"Group three (location) .

"I'm going to give each group separate instructions. When we're finished, I'll be happy to answer questions.

The experimenter gives the following instructions in turn to both treatment groups:

"Please listen to this tape I'm going to play. It lasts 20 minutes.

"When it's over, I'll be back to give some additional instructions.

"Please do not talk to each other until I give the OK.

"I'll be happy to answer questions when we're finished.

CLASS ANNOUNCEMENT

1. Today, Jim Theroux will be conducting a study which:
 - a. compares the effectiveness of a quiz show and a lecture at communicating the same information, and which
 - b. involves listening to an interesting 20 minute tape about child health and nutrition.
2. It requires a total time of 25 minutes.

BY MARKING "T" OR "F" TO THE LEFT OF EACH NUMBER, PLEASE INDICATE WHICH OF THE FOLLOWING STATEMENTS ARE TRUE OR FALSE.

1. A normal newborn baby has more resistance to cold germs than his mother or father.
2. Most babies cannot breathe through their mouths.
3. Older children on the average contract more colds than do younger children.
4. Many babies have natural protection against measles during their first 6 months of life.
5. No vaccine is available to prevent measles.
6. Cow's milk is more likely to cause colic than breast milk.
7. The tonsils of most children should be removed.
8. The older a baby is when he receives a new food, the less likely he is to develop an allergy to it.
9. Prolonged cooking of vegetables in a lot of water can remove minerals from the vegetables.
10. The more thoroughly ripe a piece of fruit, the harder it is for a child to digest.
11. An uncooked cereal has the same food value as a cooked or hot cereal.
12. Fish contains the complete variety of proteins.
13. Water contains no vitamins or calories.
14. After a frozen food has thawed, it spoils more easily than does a fresh food.
15. Most foods are composed largely of water.
16. A healthy baby's body temperature should never vary from 98.6 degrees.
17. When a child has a fever, you should force him to drink as much fluid as possible. The more, the better.
18. When a child has fever, you should strongly encourage him to eat, even if he does not want to.
19. Waterproof diaper pants increase the likelihood of diaper rash.
20. Parents need not worry about tooth decay in the child's first set of teeth because they will be replaced by another set.

21. A cereal in baked form is just as nutritious as one that has been boiled.
22. Babies naturally prefer fresh milk over evaporated milk.
23. Frozen foods are more easily digested than are fresh foods.
24. Nursing mothers can usually continue to eat all the foods they are accustomed to eating.
25. Excessive doses of vitamin D are not harmful.
26. Evaporated milk is more expensive than fresh milk.
27. Fresh milk is more nutritious than evaporated milk.
28. Fresh milk is less apt to cause allergies than is evaporated milk.
29. Lactic-acid milk is more easily digested by some babies than is ordinary sweet milk.

IN THE FOLLOWING SECTION PLEASE INDICATE WHICH RESPONSE YOU FEEL BEST ANSWERS THE QUESTIONS.

1. What is the average number of colds that children between 2 and 6 contract in a typical year?
a) 2 b) 4 c) 7 d) 10
2. A majority of illnesses among babies show the first symptoms during the _____.
1) morning 2) afternoon 3) evening
3. What does adding moisture to a room with dry air do for a cold or cough? Does it....
1) help the cold 2) prolong it 3) or have no effect
4. Which of the following meats can be especially dangerous if it is not cooked long enough?
a) chicken b) hamburger c) pork d) fish
5. Which of the following characteristics of a rusty nail has the potential of causing tetanus when a child is cut by one?
1) rust 2) iron 3) germs
6. At what age is the average baby about over his tendency to have colic?
a) 3 months b) 9 months c) 15 months
7. Which of the following is the most common symptom of allergy in babies?
1) fever 2) eczema 3) diarrhea

8. Which of the following foods are a common cause of allergy?
1) carrots 2) sugar 3) eggs
9. Which of the following grains are most likely to cause allergy?
1) corn 2) wheat 3) rice 4) oats
10. By how many degrees can a child's body temperature rise as a result of vigorous activity?
a) 1 degree b) 2 degrees c) 3 degrees
11. About how long does it take for a mouth thermometer to register the correct temperature of a child's body?
a) $\frac{1}{2}$ minute b) 2 minutes c) 5 minutes
12. Zinc ointment is used primarily to protect against:
1) allergies 2) diaper rash 3) poison ivy
13. Which of the following things are necessary to the growth of acid-producing bacteria which cause tooth decay?
1) sugar 2) starches 3) saliva 4) all of these
14. Which of the following chemicals is known to be helpful in the formation of teeth and in preventing tooth decay?
1) iodine 2) iron 3) fluoride
15. If a child has a high fever (104 or greater), how should he be cared for?
1) light covers in a room at ordinary temperature
2) heavy covers in a warmer-than-usual room
16. Which of the following is the best source of calcium and phosphorus?
1) cereals 2) milk products 3) vegetables
17. How many ounces of ordinary cheese are required to provide an equivalent amount of calcium found in 8 oz. of milk?
a) 1 oz. b) 3 oz. c) 6 oz. d) 8 oz.
18. How many ounces of cottage cheese are required to provide an equivalent amount of calcium found in 8 oz. of milk?
a) 1 oz. b) 3 oz. c) 6 oz. d) 8 oz.
19. Which of the following foods contain the complete variety of proteins which the human body needs?
1) fruits 2) eggs 3) vegetables 4) grains
20. What percent of a baby's body weight is water?
a) 50% b) 60% c) 75% d) 90%
21. Starches are composed of chemical combinations of what kind of material?
1) vitamins 2) proteins 3) sugars 4) minerals

22. Which of the following foods has the most calories per ounce?
1) potatoes 2) sugar 3) butter 4) margarine
23. For what part of the body is vitamin D of particular importance?
1) skin 2) bones 3) brain 4) liver
24. Which of the following vitamins are usually deficient in both cow's and mother's milk?
1) vit. B 2) vit. C 3) vit. D 4) vit. E
25. Which of the following foods contains the least amount of vitamin C?
1) tomatoes 2) potatoes 3) cabbage 4) lemons
26. Direct sunlight can produce which vitamin in the skin?
1) vit. A 2) vit. B 3) vit. C 4) vit. D
27. Which of the following vitamins is destroyed by 180 degree heat?
1) vit. A 2) vit. B 3) vit. C 4) vit. D
28. What does boiling do to the digestibility of a baby's formula?
1) increases digestibility 2) decreases digestibility
3) has no effect
29. What is the amount of milk often recommended for nursing mothers to drink daily?
a) 1 quart b) none c) 2 quarts
30. Which of the following amounts of formula are what an average 8-pound baby will consume in 24 hours?
a) 12 oz. b) 28 oz. c) 42 oz.
31. Which of the following elements cause hardness of the bones and teeth?
1) iodine and vitamin B 2) zinc and marrow 3) calcium and phosphorus

APPENDIX C

Data Analysis

1. Raw Scores
2. One-Way Analysis of Variance
3. t-tests

APPENDIX C-1

Raw Scores

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Quiz Show GroupLecture GroupControl Group

48	43	34
57	52	29
46	28	33
57	53	35
52	50	40
58	42	35
55	56	26
58	50	37
54	48	40
56	46	42
58	40	34
55	39	35
55	58	27
53	55	35
52	45	30
56	46	33
53	56	38
52	55	39
50	49	30
54	56	29
55	42	37
51	57	38
47	30	26
47	55	32
55	42	32
56	56	32
58	53	37
57	51	25
51	47	30
58	52	35
54	49	39
56	52	38
54	44	32
50	39	37
58	54	33
53	55	31
50	48	40
57	41	40
56	55	34
48	50	35

Appendix C-2: Analysis of Variance

Formulae used:

$$F = \frac{M S_b}{M S_w} \quad M S_b = \frac{S S_b}{J-1} \quad M S_w = \frac{S S_w}{J (n-1)}$$

$$S S_b = \frac{(\sum x_q)^2 + (\sum X_1)^2 + (\sum X_c)^2}{n_c} - \frac{(\sum \sum X_{q1c})^2}{n}$$

$$S S_w = \sum \sum X_{q1c}^2 - \frac{(\sum X_q)^2 + (\sum X_c)^2 + (\sum X_1)^2}{n_c}$$

Appendix C-3: t-Tests

Formulae used:

$$t = \frac{\bar{X}_a - \bar{X}_b}{\sqrt{\frac{(n_a-1)S_a^2 + (n_b-1)S_b^2}{n_a + n_b - 2} \left(\frac{1}{n_a} + \frac{1}{n_b} \right)}}$$

$$S_x^2 = \frac{n \sum_{i=1}^n X_i^2 - \left(\sum_{i=1}^n X_i \right)^2}{n(n-1)}$$

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