REVIEW OF LITERATURE
CONTENTS

1.1 Philosophy of nutrition education

1.1.1 Need for nutrition education
1.1.2 Role of nutrition education
1.1.2.1 Challenge of nutrition education
1.1.3 Identification of priorities in nutrition education
1.1.4 Operational components of nutrition education
1.1.5 Nutrition education as an intervention strategy
1.1.5.1 Indian context
1.1.5.2 In schools
1.1.6 Nutrition education: School experiences
1.1.7 Focus on adolescents
1.1.7.1 An overview of the studies on nutrition education for adolescents
1.1.8 Communication in nutrition education
1.1.9 Games – usage, target groups and effectiveness
1.1.9.1 Usage of games
1.1.9.2 Form/type of experience
1.1.9.3 Content of games
1.1.9.4 Measurement of variables
1.1.9.5 Educational functions of games
1.1.9.6 Experiential learning through games

1.2 Considerations in design and conduct of experiential learning

1.2.1 Principles
1.2.1.1 Obstacles to playing educational games in schools

1.3 Nutrition games

1.3.1 Nutrition games for high school students
1.1 Philosophy of nutrition education

1.1.1 NEED FOR NUTRITION EDUCATION

Current concerns in development in the context of education are compulsory schooling for children, nutrition/health education, functional literacy and mass literacy programmes. All these programmes in formal and non-formal sectors of education are to create and raise awareness amongst the different segments of the population, to issues which impede development. The hope is that heightened awareness would subsequently influence decision-making and launch effective action.

The incidence of malnutrition among the vulnerable segments of world's population is well known. In India, one sixth of the total population is estimated to be suffering from malnutrition. Between 2-5 per cent of the infants and children are estimated to be suffering from severe protein calorie malnutrition. Almost 15 per cent of the children admitted in hospitals exhibit frank nutritional deficiencies (Shukla, 1982).

1.1.2 ROLE OF NUTRITION EDUCATION

Nutrition education aims at controlling decisive/significant factors which precipitate or perpetuate malnutrition, in any particular region/target group.
Nutrition education helps to formalise and internalise awareness of Foods and Nutrition. The focus is also on people who do have the means to afford a nutritionally adequate diet, but, make unwise food choices due to lack of information or motivation.

Nutrition education has been defined in various ways. All the definitions refer to a communication system that teaches people to make better use of available resources (Zeitlin and Formacion as quoted by Dan Hartog, 1982). Leverton (1974) defines nutrition education as "a multi-disciplinary process that involves the transfer of information, the development of motivations and the modification of food habits where needed".

In nutrition education, the ultimate aim is to equip people with nutrition knowledge, so that they develop a critical consciousness. This in turn, would result in critical intervention by them to transform their own health status.

Gramsci's views (1988) on education are relevant in the field of nutrition education. He said, "education is not a matter of handing out encyclopaedic knowledge, but of developing and disciplining the awareness which the learner already possesses".
Wheeler has cited examples of situations wherein, nutrition education can be effective for the migrant population who seek work in cities, for people who have to get adjusted to new food crops, urban life styles and cash economy, and, various other influences which need to be deliberated upon. Education in nutrition therefore becomes ubiquitous and essential at all levels, to all segments of the population.

The importance and role of nutrition education is being widely appreciated (Sinclair 1985, Morley 1985, Wheeler 1985, Bagchi 1985, Devadas 1985 and Schurch 1982). Turner & Ingle (1985) quote the reasons for teaching nutrition as summarised by a latin American,

"Nutrition is taught so that families gain the understanding, knowledge, skills and attitudes necessary to act rationally in the selection, production, organisation, storage, preparation, distribution, consumption and safe handling of food, consistent with individual needs and available food and economic resources".

The importance of nutrition education requires no special emphasis. As stated earlier, it is relevant for all age groups at all levels. The school going children/adolescents comprise a vital target group in this spectrum. Their understanding of food and nutrition would influence
their food choices, and, their development as productive citizens.

1.1.2.1 Challenges of nutrition education. The educator is challenged to provide clear guidance about nutrition concerns which are culture based and can never be well defined and applicable to all situations. In the Western world, material resources are not the major constraints. The people are free to choose foods without monetary restraints. Rather, social aspects like lack of information, urge to conform to specific life styles, status association and powerful influence of advertisements are the constraints. The problem therefore is how to put across relevant nutrition messages effectively. Nutrition education would facilitate wise food selections and thereby promote better health status. In the third world countries, nutrition status is affected by various socio-cultural as well as economic constraints. Lack of money, lack of knowledge, beliefs and superstitions about foods are some of the restrictive factors. The focus of nutrition education would be, to have culturally appropriate educational approaches to suit the lifestyles of the people. Also, optimal utilization of local resources would ensure a nutritionally adequate diet.
1.1.3 PRIORITIES IN NUTRITION EDUCATION TO ENHANCE NUTRITIONAL STATUS

For the developing countries, Morley (1985) has rightly emphasized on the importance of influencing the national decision-makers to provide 'adequate food intake' to the people. However, he has stated that, this is difficult unless it is accompanied by comprehensive health care.

The economic constraints operating on the individual's nutritional status in India, has to be taken into cognisance, while fixing priorities in nutrition education.

The socio-economic environment, political administration, food availability, family roles and experiences in the cultural context, level of education and awareness of the body's nutritional requirements, unityldy affect the food choices and behaviour and ultimately the nutritional status of an individual. There is a consensus amongst the nutrition educators that a holistic approach is to be adapted to improve on the individual's health status (Yetley 1981, Pelto 1981).

Identification of priorities in nutrition education is to ultimately enhance the nutritional status of any
individual. This requires a recognition of various influences - either primary or secondary having a bearing on the individual's nutritional status. The present investigator has put forth a model to delineate various influences on the nutritional status (Fig. 1). To protect the individual against malnutrition, certain primary factors which have a direct and immediate bearing on the nutritional status of an individual and secondary factors which have an indirect effect have been identified. In any family, the primary factors are the economic resources, food distribution, quality and quantity of foods available, social roles, level of education, exposure to and influence of mass media. All these factors form the inner circle directly affecting the nutritional status. In turn, each of these primary factors may be affected by other indirect influences, such as those presented in the outer circle of the model. For instance, the social roles ascribed to a family member are a consequence of the cultural influence and the value systems or behavioural interventions. The social role of the man as the bread winner and the decision maker assures him of better servings of food and a better nutritional status compared to the woman. The personal and environmental hygiene and motivation of an individual to improve his/her nutritional status would be directly affected by the level of education and vice versa.
Fig. 1: Factors Affecting the Nutritional Status

- Motivation
- Environmental and Hygiene
- Personal and Cultural Influence
- Health
- Value Systems
- Behavioural Interventions
- Economic Resources
- Mass Media
- Social Roles
- Geopolitical Environment
- Education
- Quality and Quantity of Food
- Distribution

Nutritional Status
It is possible that the presence of any one factor (either primary or secondary) could cause a chain reaction, setting into motion the viscous cycle of malnutrition. The interrelatedness of all the factors indicated in the model towards determining the nutritional status of an individual is to be appreciated.

The goal of nutrition education in the third world countries is to prevent/overcome malnutrition. This requires a relevant, appropriate, educational strategy within the regional/cultural context, mindful of the operational constraints in a developing economy.

1.1.4 OPERATIONAL COMPONENTS OF NUTRITION EDUCATION

Bailey as quoted by Hollingsworth (1985), listed essentials for planning a nutrition education programme:

1) determination of food consumption, and its nutritional value by different groups in the community,

ii) study of traditional food habits,

iii) planning of the means of conveying information,

iv) evaluation of the effectiveness of the programme and,

v) a co-operative study of all concerned .... to investigate the cause of weakness in certain channels of nutrition education and to recommend desirable changes in the approach.
The emphasis here is on the establishment of a strong base/background and monitoring which would make the nutrition programme more effective.

For effective nutrition and health intervention McLoughlin and Davies (1985) have focused on the following issues:

i) the language and knowledge of the academician need to be replaced by the language and functional knowledge of the extension agent,

ii) the amount of nutrition information is to be reduced to a manageable size and permit generalisations.

Mosio (1985) has advocated a holistic orientation, treating the basic causal factors of a nutrition situation, and not to establish a biochemical knowledge base as if it were a prerequisite.

In this context, it is wise to exercise education. More often than not, when an education programme is planned, the planners fall into a trap. They are so concerned with the target or end product; that, the process of communication/acquisition of the knowledge by the receiver tends to be overlooked.

Israel (1985) suggested pinpointing of the target
group's resistance points to change and, seeking of help from that group itself to develop practical solutions that will overcome the resistance. A realistic analysis of the underlying socio-economic causes coupled with a coordinated attack on the complex of causative factors has been emphasized by Wheeler (1985).

All these points listed by the nutrition educators are valid. However, the outlook in the third world countries like India, with its varied cultural and regional imbalances requires consideration of certain other aspects too. In India, any nutrition education programme has to reckon with three major resource constraints of the target groups viz., lack of time, money and knowledge.

Any nutrition project should meet the greatest nutrition need of the area, and the most pressing nutritional problems of the country. In short, the programme's focus should be topical.

The programme must be within the cultural context. It should be cost-effective, technically feasible and have affordable means of bringing about changes in behaviour and food consumption, with the likelihood that such actions will lead to better nutrition.
Most importantly, the participants in the programme ought to be able to directly relate to the objectives of the programme. A personal involvement would motivate the individuals and this in turn would ensure effective implementation.

Thomas and Harrie-Augstein (as quoted by Pope and Keen, 1981) have said very succinctly that -

"For education to be an encouraging experience, the meanings that emerge must be significant, or important in some part of the person's life".

1.1.5 NUTRITION EDUCATION AS AN INTERVENTION STRATEGY

In the third world countries, several intervention strategies are being adopted by national/international organisations and agencies to deal with the problem of malnutrition. In most of the programmes, food supplementation and health care are the two major components, with nutrition education being a 'rider'.

While malnutrition or nutritional deficiencies, are overcome by the immediate provision of food supplements and health care, the concern should be to educate the individuals to prevent a relapse. In this context a study by Popkin et al (1981) presented significant outcomes
The two year project in Phillipines included three types of interventions to eliminate xerophthalmia in children (1-6 yrs). One intervention provided 200,000 IU of vitamin A every six months. The second intervention had monosodium glutamate fortified with vitamin A. The third was a public health intervention program with an integrated approach inclusive of health education, sanitation, immunisation and horticulture. The first two interventions produced significant benefits in terms of treating xerophthalmia. The third intervention was a comprehensive strategy which not only educated the parents but also provided a wide range of other benefits. The point to be noted in this study is that while interventions in terms of supplementation and health care are necessary, it is equally important or even more so to place due emphasis on the nutrition education. This approach has long-term benefits to the individual both in terms of quantity and quality. Supplementation and other interventions however are less likely to produce such effects.

While considering a number of possible interventions, it would be appropriate to review the Tamil Nadu Integrated Nutrition Project (TINP) in India, assisted by World Bank (Berg, 1987). This project concentrated exclusively on 6 to 36 month old children, expectant and nursing women over a six year period. The project identified 'at risk'
children and mothers. Supplementary feeding, growth monitoring, and a comprehensive communication programme—both personal instruction and mass media were the main features of this programme. The emphasis on monitoring of growth as a form of nutrition education (with short term supplementary feeding as a corollary rather than dominant activity) gave impressive results. The TINP has demonstrated that a properly executed intervention programme with emphasis on the education component is feasible, effective and acceptable to the community.

A fast emerging strategy is the adaptation of social marketing technique. Such a strategy would have to take into account the learner characteristics and the characteristics of the setting in which the education is to take place. The Indonesian project which adapted this technique was highly successful (Berg, 1987). Mothers with children under five were identified and messages were targeted to them. The nutrition education was carefully planned and implemented with in-built evaluation. Villages with the nutrition education programme had no supplementary feeding. This study reiterates the importance of an effective intervention in the form of nutrition education, for modifying the behaviour of specific groups with specific requirements. An intervention strategy with
nutrition education as its main component, would be most appropriate, where the problem appears to be predominantly an educational one.

These various aspects of different educational interventions would need to be effectively incorporated to enhance the success of various programmes in operation in India.

1.1.5.1 Indian Context. In India, various programmes like the special nutrition programme (SNP) applied nutrition programme (ANP), midday meal programme (MDM), integrated child development services (ICDS) have a package delivery services of nutrition, immunisation, health services, employment schemes and nutrition education. All these programmes benefit the women and children (<10 yrs) of the rural/urban slum areas (Krishnamoorthy, 1986, Tandon, 1986). The main focus in these programmes appears to be supplementation, health care and employment but not nutrition education.

A summary of various intervention programmes in India is given here:
### Summary of Various Intervention Programmes in India

<table>
<thead>
<tr>
<th>Name</th>
<th>Beneficiaries</th>
<th>Main objectives of the programme</th>
<th>Area of operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midday meal programme (MDM)</td>
<td>Elementary school children</td>
<td>i) to improve nutritional status of school children,</td>
<td>Rural and Urban</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii) to attract enrolment and regular attendance in schools.</td>
<td></td>
</tr>
<tr>
<td>Special nutrition programme (SNP)</td>
<td>Children 0-6 years, pregnant women and lactating mothers</td>
<td>To provide supplementary food for children and mothers.</td>
<td>Tribal, backward areas and slums.</td>
</tr>
<tr>
<td>Applied nutrition programme (ANP)</td>
<td>Low income group families, mothers and children</td>
<td>Nutrition education through home, kitchen, School and community gardens, poultries and piggeries</td>
<td>Rural and/or tribal areas.</td>
</tr>
<tr>
<td>Minimum needs programme (MNP)</td>
<td>Weaker sections of the population, elementary school children and families.</td>
<td>i) to reduce regional imbalances in development,</td>
<td>Rural</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii) elementary/adult education, rural health, water supply, roads, electrification, housing and nutrition.</td>
<td></td>
</tr>
<tr>
<td>Integrated Child Development Services (ICDS)</td>
<td>Pre-school children (1-5 yrs), Pregnant women and lactating mothers.</td>
<td>i) Child health and nutrition,</td>
<td>Rural and urban.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii) Food supplements,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>iii) Prophylactics, iron and folic acid,</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>iv) Immunisation,</td>
<td>contd.....</td>
</tr>
<tr>
<td>Name</td>
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</tr>
<tr>
<td>Development of women and children in rural areas (DWCRA)</td>
<td>Women, Children below 3 years of age.</td>
<td>v) Preschool education vi) Nutrition Health Education programmes for women.</td>
<td>Rural</td>
</tr>
<tr>
<td>Training of rural youth for self employment (TRYSEM)</td>
<td>Youth (18-36 yrs) from low-income families</td>
<td>To promote technical skills among youth, to take up self employment.</td>
<td>Rural</td>
</tr>
<tr>
<td>Rural landless employment guarantee (RLEG)</td>
<td>Unemployed, landless adult population</td>
<td>To create durable community assets and other infrastructure in rural areas. To provide employment for 100 days in a year.</td>
<td>Rural</td>
</tr>
<tr>
<td>National rural employment programme (NREP)</td>
<td>Unemployed adults</td>
<td>Generate additional gains for employment</td>
<td>Rural</td>
</tr>
<tr>
<td>Integrated rural development programmes (IRDP)</td>
<td>Unemployment youth and adults</td>
<td>Creation of assets through self employment in sericulture, animal husbandry, weaving, handicrafts.</td>
<td>Rural</td>
</tr>
</tbody>
</table>

Source: Towards the implementation of a national nutrition policy in India (1986), ICMR Report, New Delhi.
Poverty alleviation programmes like national rural employment programme (NREP), drought prone areas programme (DPAP), integrated rural development programme (IRDP) and training rural youth for self-employment (TRYSE!) - all focus on the rural poor and youth (18-36 yrs). A notable omission in these various programmes is the vulnerable adolescent group. Even in these programmes nutrition education does not feature significantly.

Gopalan (1988) has rightly stressed on the pressing need to strengthen the nutrition education component in the various intervention programmes. On paper, nutrition and health education is part of the programme, but in practice, emphasis is on the curative aspects of nutrition intervention.

All the intervention programmes have been successful only to a limited extent. The probable cause for this limited success could be either one or all of the following:

(i) lack of holistic approach (ii) very limited community participation (iii) absence of optimal usage of local resources (iv) lack of constant monitoring and evaluation and, finally (v) lack of effective implementation of nutrition education.

A programme needs to train people for independence
not dependence. The concerned group should be educated to come alive, organise and activate itself to resolve the prime issues of health and nutrition at its own level, within the local context. Then, the people would be aware of the power and limitations of available resources and be prepared to act for a change. It would be quite a revolutionary method to promote a new health order. Such an education would be a powerful weapon especially in the hands of the vulnerable, neglected group of adolescents.

Food supplements entice people to the various nutrition and welfare interventions. Food supplements and ill-health treatment are immediate, visual benefits. So, people are attracted to these programmes. But, a candid admission is that these are only 'relief' measures. People are thus being trained to become 'eternal' dependents, and conform to existing conditions.

Education would permit them to think and question - why a problem? What is the underlying cause of a problem? How can one overcome it?

Welfare measures which serve as anesthetics divert the attention of the gullible and deprived. They distract the people from the true cause of their problems and prevent them from seeking concrete solutions to their problems.
Education as a dynamic, stimulating experience, would motivate individuals to develop themselves. This is especially true in the case of the children and youth who have a flexible outlook on life.

1.1.5.2 In schools. The Nutrition, health education and environmental sanitation project (Bhattacharya, 1987) implemented in several schools of the Indian states has met with a fair measure of success. The project included training of primary school teachers to use an integrated syllabus for the primary schoolers. The results of the project indicated gains in nutrition knowledge, improved dietary practices, better hygiene and reduction in the symptoms of nutritional deficiencies among the primary schoolers. This again demonstrates that nutrition education can promote better nutritional status.

Devadas (1986) has reported about a highly successful nutrition education programme among school going children in Tamil Nadu. The nutrition knowledge, behaviour and health status of these children had improved significantly after intervention in the form of nutrition education. Darras (1985), Edema (1985), Galeazzi et al (1985) and Devadas (1985) have all reported improvement in nutrition knowledge, attitudes and practices of primary school children using an integrated curricular approach to nutrition in schools.
While nutrition education as an intervention strategy is well appreciated, it is equally important to outline certain essential components/factors which work towards improving the efficacy of a programme. The investigator has put forth a model, wherein three major components/factors - education, persuasion and action are involved in the success of a nutrition education programme (Fig. 2). In education, inputs in terms of awareness of the target group's needs and creation of interests in them towards the programme are involved. In persuasion, the change agent and learner are engaged in a dialogue in the community context, motivating them to participate in the programme. Ultimately, this would lead to action by the participants utilizing their own resources, evaluating the programme and finally adoption of the same.

At all three stages, both the change agent and the learner are involved. The change agent has a bigger role to play at the education input and persuasion stages. In the final stage it is the learner who takes on a major role.

1.1.6 NUTRITION EDUCATION: SCHOOL EXPERIENCES

The school as a setting for launching effective nutrition education needs no emphasis. The personality of a child and his/her development as an individual takes place largely in the school. It is therefore important
that children learn about nutrition in terms of wise food selections and appropriate eating practices in the school setting. For this, the learner's characteristics, teacher's influence, mode of communication as also the school atmosphere itself will have a bearing on what the child learns. Certain studies are reviewed against this background.

Skinner and Woodburn (1963) assessed the relationship between nutrition related teacher characteristics and effective nutrition education for the teenage students. In this study sixty-two high school teachers were assessed for seven characteristics - their knowledge of nutrition, subject confidence, self confidence as nutrition educators, interest in nutrition, value placed on nutrition, flexibility towards nutritional practices and dietary practices. One thousand and seventy three students were assessed for the nutrition knowledge and dietary practices before and after learning of a nutrition unit in class. Of the seven teacher characteristics assessed, a significant relationship was observed between teacher's knowledge and the changes in their students' nutrition knowledge and practices. All the teachers' characteristics were significantly interrelated.

This study stresses the importance of a solid base in teachers, to precipitate cognitive changes in their
students. The teacher must be competent in the subject matter to develop self confidence and become effective nutrition educators.

Marr et al (1980) conducted a study in the state of Pennsylvania. In this study, junior and senior high school administrators and teachers of all subjects were included in a survey to ascertain their perspective on nutrition education for students in grades 7-12. The survey reported a strong agreement among all respondents that nutrition should be taught in grades 7-12. Both teachers and administrators favoured an integration of nutrition education in the existing courses rather than teaching it as a separate course. The most appropriate courses for integration suggested were health, home economics, biology and physical education.

In a developing economy as in India, Nutrition as a separate subject would hardly be feasible, in view of the resource and operational constraints which occur in the Indian schools. An integrated approach would be suitable, the subjects being physical education, biology, health education, socially useful and productive work. Home economics is not a subject in the Indian school curriculum.

Duff et al (1975) studied the food habits of 75 teenage American school girls of Puerto Rican origin. A
questionnaire and 3-day food records were used to ascertain the nutritional adequacy of their food intake. The ethnic food patterns made significant contributions to the diet. The teenage girls were found to have higher intakes of vitamin C, but iron, vitamin A and calcium were found to be below the two thirds of daily intake recommended in the U.S.A. A typical pattern of food consumption among teenagers in the U.S., was seen among the subjects' of the study. High calorie snack foods were taken. The diet was related to knowledge and socio-economic variables. Better knowledge of nutrition and socio-economic status resulted in better dietary intake. This study is a clear indication of how the ecological and socio-economic environment moulds the food pattern of an individual. The study also reveals that though the urge to satisfy hunger is fundamental, food patterns are influenced by cognitive (knowledge) and cultural variables as well. The key to acceptance of nutrition education as an intervention, would lie in dietary modification of inadequate food habits wherever existing to enable an individual to make wise food choices.

Head (1974) carried out a study to determine whether nutrition education for elementary, junior and senior high school students would contribute to any changes in food habits, or acceptability of foods served in the school
lunch. The teachers who conducted this programme had earlier attended a one week workshop on basic issues in nutrition. The nutrition education programme was given to the fifth, seventh and tenth grade students. All the students had significantly improved their knowledge of nutrition compared to that of the control groups. The 3-day dietary recall data showed that the diets of the seventh graders had improved significantly after nutrition education. Plate waste from school lunch had decreased significantly among fifth graders compared to the other groups. The author is of the opinion that in nutrition education programmes the role of teachers and administrators cannot be underestimated.

This study once again reiterates the need for an integrated approach to nutrition education in schools, in the light of the various operational constraints in these institutions.

Operational constraints and an overworked school curriculum cannot be overlooked. Yet, it must be appreciated that, given a willing teacher, a motivated learner and an integrated approach, nutrition education can have an impact on the eating behaviour of the younger age groups. Such an approach would be well appreciated in a developing country like India, given its resource constraints.
1.1.7 FOCUS ON ADOLESCENTS

The adolescents in India are a much neglected lot, especially the girls. In India research studies on nutrition education for adolescents are sparse. The need to focus on the adolescents as a group is being increasingly felt by researchers across the world. With regard to the nutrition of the adolescents, the problems are due mainly to a failure to identify and understand the nutrition problems and requirements of the adolescent. The nutritional requirements of adolescents are high because of the critical growth spurt characteristic of either sex (Dwyer, 1981). The second growth spurt offers an opportunity for the adolescent to 'catch up' growth which he/she may have lost during the primary growth spurt. The various physical, physiological changes and mental stress during teenage call for improved nutrient intake of boys and girls (Hager, 1981, Tanner, 1981). Improvements in dietary practices are hindered by the adolescents' concern to conform to the peer group life style and need for social acceptance (Loviik, 1981 Truswell, 1981). The teenager usually follows the ground rules laid down by his/her peer group in terms of type of foods eaten - usually a high calorie, low nutrient density 'fast' foods. Moreover, the adolescent is growing to be conscious of his/her figure. Therefore dieting is also to
be reckoned with during adolescence. In this context, fostering improved eating behaviour among the adolescents becomes extremely difficult.

Nutrition education programmes particularly can make a vital impact on the eating practices of the adolescents.

Bentwich and Trostler (1985) carried out a survey on breakfast habits of 352 teenagers (13-17 yrs) at the high school in Rehovot, Israel. They reported poor breakfast habits (skipping it). This habit, the authors felt may possibly have been due to the teenagers' parents not attaching importance to the breakfast as a meal. The poor breakfast habits are likely to have an effect on their scholastic performance. All the more reason for nutrition education for the adolescents, to make them realise the importance of nutrition.

Axelson and Delcampo (1978) reported a study wherein nutrition education using mass media (T.V., radio) on Florida teenagers, registered a significant gain in their nutrition knowledge. The areas of nutrition covered included nutrients, their functions, need, food sources and energy requirements of adolescents. The geographical area, wherein the study was conducted had the blacks as a dominant population (48.8%). Therefore, the communicators of the nutrition messages both on T.V. and radio included
blacks and local athletes. The experimental groups performed better than the control groups. The blacks in the experimental group performed better than the whites.

The results of this study draw attention to one significant fact. In a nutrition education programme like the mass media promotional campaign, the communicator credibility is important for audience involvement and impact on nutrition knowledge.

Kaufmann et al (1975) studied the nutrition beliefs and eating habits of 251 boys and 231 girls (14 yrs of age) in Jerusalem, Israel. While more than half the subjects of both sexes had normal weight, about one quarter were underweight and the remaining were overweight. Over two thirds of both boys and girls believed that daily consumption of milk, bread, fruits, eggs, cheese, meat and tomatoes is desirable. Eating of sugar, butter, fish, poultry and margarine was expressed to be desirable by less than a third of the children. The lower socio-economic class subjects were found to consume bread more frequently compared to the other subjects. Overeating, eating of wrong foods, insufficient physical exercise were the main causes of obesity according to the teenagers. Overweight children, especially girls reported eating less of sweets, ice-creams, bread, cake, cream and adding less sugar to beverages compared to thin and normal weight children.
Overweight teenagers appear to be more conscious of their food intake, and reported skipping of meals too.

While overweight is illadvised, irregular meal patterns, wrong choice of foods, misconceptions of foods are some of the basic issues concerning adolescent nutrition education. These issues should be tackled, in order to develop healthier adolescents/individuals.

Schwartz (1975) reported no significant difference in the knowledge, attitudes and practices of women who had been earlier exposed to nutrition education in high school and those who had no such exposure. This finding, the author has rightly attributed to limitations in techniques, strategies and materials available, and those being used to teach nutrition to students. In nutrition education, not only should the concepts of nutrition be learnt but also the application of the concepts in terms of food selection and eating behaviour.

Food and eating practices of 16-17½ years old teenagers of both sexes (N=122) were studied by Huenemann et al. (1968) for a period of two years. The findings revealed marked irregularity in eating amongst subjects of ethnic origin like negroes, orientals and caucasians. The ethnic subjects did not have fixed pattern of eating from day to day. Their meals lacked a variety of foods and had very
limited planning. Breakfast and lunch were eaten less regularly. The authors linked this pattern to the socio-economic levels of the ethnic groups. Vegetable snacks were eaten infrequently by all boys and girls. Snacking was common to all subjects.

The study emphasizes that ethnic food patterns and socio-economic levels of the target groups have to be taken into cognisance, while delivering nutrition education to a particular group. There is also a necessity to educate the adolescents on the importance of wise food selections and eating high nutrient density foods.

Whitehead's (1960) study on 445 adolescents (boys and girls) of a relatively homogenous group in Kansas city, Missouri, underscored the point that intentionally developed programmes of nutrition education can cause increased dietary intakes. One research group of seventh grade students participated in the programme for a year. Whereas, the sixth grade students took part for two years. The results of the one year study indicate that immediately after nutrition education, the intakes of eggs, whole grain cereals and butter or margarine were appreciably higher in the experimental group than those of the controls. Consumption of citrus fruits and green leafy vegetables however was lower in the research group as compared to the control group.
When 2 years of nutrition education was given, the research group had intakes of all food groups above the recommendations in contrast to the intakes of the control group.

The results of the study, suggest that though dietary habits have deep cultural roots, a well conceived, deliberately planned nutrition education programme can bring about qualitative changes in diets. A longer duration of nutrition education would be more effective. In a well conceived education programme the aspects of content, method, approach and materials would be taken into cognisance.

The studies reviewed have highlighted the need for promoting good nutritional practices among adolescents. Among several factors involved in adolescent nutrition, the most common one is that, the growing adolescent is under the impression that good nutrition is synonymous with eating foods which he/she dislikes. But he/she should learn to associate good nutrition with wise food selections and good eating habits for realising one's aspirations in life.

Besides this, as has been indicated earlier, the adolescent often learns about nutrition from an individual who may not be competent in the subject and who will not
be in a position to create a value for good nutrition. In such an instance, nutrition misinformation is also a dangerous possibility. The messages in nutrition education should therefore be carefully framed and delivered by a competent person.

Leverton (1968) has expressed the view that adolescents often tend to make the wrong choice of foods and have poor eating habits. They have misconceptions about food. He stresses on appropriate communication technology to promote adolescent nutrition.

1.1.7.1 An overview of the studies on nutrition education for adolescents. The various features which emerge from the review are

1. Nutrition and health education cannot be over emphasized for the high school adolescents.

2. Food misinformation and misconceptions are widely prevalent amongst the adolescents. There is proneness to conform to peer group food patterns and to dieting to maintain one's figure. Food quality is related to likes and dislikes.

3. The nutrient intake of the adolescent is a matter of grave concern - especially among girls.
4. The strong possibility of nutrition knowledge affecting the nutrition behaviour has been indicated.

5. In schools, a committed administration and teachers have a significant role in modifying or improving the eating habits and dietary practices of adolescents through well conceived and purposeful planned educational programme.

6. Teachers and students prefer an integrated approach to nutrition education, rather than have it as a separate subject.

7. There is an urgent need to conduct research on communication strategies, teaching materials and learning to experiences - not only to teach the basic concepts of nutrition, but also the application in life, for wiser food selection.

1.1.8 COMMUNICATION IN NUTRITION EDUCATION

The success of a nutrition education programme will depend to a great extent on the communication system adopted. Communication is an integral part of an educational intervention programme.

Yarbrough (1981) views communication from 3 perspectives: communication effects, social relationships and pragmatics. The perspective of communication effects relates to what communication can do to the audience the
behaviour of the audience who attend, comprehend and respond. Yarbrough comments that messages are interpreted mainly in terms of the sender's intention. The sender knows what to look for but, does not look for the unintended consequences of the communication among the audience. Persuasion and motivation required for an audience to accept the programme are not adequately emphasized. The communication, effects perspective is useful for evaluating short term education effects from the programme planner's viewpoint.

The social relationships perspective focuses on how formal and informal group memberships influence responses to communication. The diffusion and acceptance of concepts and innovations would be affected by the level/state of interpersonal relations in the group. In nutrition education, this perspective involves group change, as individuals are members of the existing groups. Group changes can be effected by adopting education methods suited to the audience quality. The reciprocation to a particular message will differ from a literate to an illiterate person. Social relationships call for a long term programme evaluation.

The pragmatic perspective sees communication as an ongoing, dynamic process which involves reciprocal responses (dialogue) of communicating individuals. Responses are largely determined by the context within which the
communication occurs. Not only is the content transmitted but also cues as to how the content is to be interpreted. This perspective implies that communication occurs between interacting units (sender and receiver) whether or not it is deliberate, conscious or successful. It is probably the most applicable to cases, of face to face communication encounters.

Thus, for successful communication in a nutrition programme, it would be appropriate to remember Paulo Freire’s statement that

"Dialogue is essential in communication
Communication is required for true education" (1982)

Studies wherein innovations in methods, media and aids for learning have been adopted to impart nutrition education to children are reviewed against this background.

Graves et al (1982) conducted a cross-sectional study on school children from the kindergarten to sixth grade. The nutrition education programme was carried out for a period of 9 weeks. Pre and post testing was done. The teachers who participated in the programme had attended a preparatory workshop before teaching nutrition to the children. The background nutrition information for each lesson and an array of activities were designed to help pupils in class. The activities included lunch-room
centred posters, and, comic book characters conveying nutrition messages. Games such as word puzzles were also included. The study reported a favourable effect of nutrition education on the knowledge and attitudes of the children. The researcher felt that if such programmes were offered through all grades, the potential for improving nutrition knowledge and attitudes of children would be enhanced. This would in turn favourably affect food behaviour.

Shannon et al (1982) have reported on the dimension of food practices of children who were the subjects in the previous study. They have dealt specifically with the impact of nutrition education on the consumption of (i) snacks offered to the kindergarten children, (ii) selected school lunch items by first through sixth graders and (iii) children's food requests at home, as reported by parents. The education programme emphasized the importance of eating a variety of foods, particularly nutrient rich vegetables (broccoli, carrots, spinach, tomatoes) and whole grain cereals. The results of the programme when viewed in the light of the study reviewed earlier, indicate the beneficial effects of nutrition education. A high percentage of parents reported that, after the programme, their children asked more often for foods of high nutrient density (whole grain cereals, meat, dairy products, vegetables.
and fruit) and, less often for foods of low nutrient density such as sweets and candy, cookies and cakes, soda, potato chips, sugary cereals and junk foods.

The two studies demonstrate the role of the 3 perspectives of communication effects, social relationships and pragmatics in nutrition education.

A short term evaluation of the education programme demonstrated the success of the communication effects perspective. The evaluation of the programme has also recognised the importance of a long term project to bring a favourable change in food behaviour. This point has already been indicated earlier too. This programme also indicates the pragmatic perspective that a face to face encounter in nutrition education is bound to have a positive effect on the receiver.

Axelson and Delcampo (1978) used the mass media to impart nutrition knowledge. A random sample of ninth graders in Florida was the target group. The programme was for a period of eight weeks. In some of the T.V. commercials spot announcements, the models included blacks, local atheletes, who emphasized the need for vitamin A, iron, vitamin C and calcium. These commercials were shown during prime viewing times. The gain scores in nutrition knowledge of the experimental group were significantly more
than those of the control group. The blacks in the experimental group (for whom the presentations appeared to have a special appeal) had increased their scores compared to the whites in the same group.

This study indicates that when mass media programmes have audience involvement, it will result in better success. In this instance, the subgroup of blacks in the experimental group were able to relate to the black models on T.V. There was a sense of involvement and identification. Hence, the blacks in the experimental group performed better than the whites in the experimental groups.

Devadas et al (1982) have reported improvement in nutrition knowledge of Indian children, when a variety of methods like lectures, demonstrations and discussion were used to convey nutrition messages to the children. Suitable audiovisual aids were also used.

Ramadasmurthy (1978) attempted to assess the amount of nutrition related knowledge retained from 2 television programmes aired by SITE (Satellite Instructional Television Experiment) in India. A group of school children who watched the programmes frequently were the experimental group. The results showed that the recall of information was fair and independent of subject matter and children's age. The author recommended an improvement in
programmes and better collaboration between programme producers and nutritionists.

It is evident that new ways, innovations have to be devised to reach more people in the community. Moreover, unless a message is effectively communicated within the cultural and regional contexts of a group like that of the school children, the impact of any programme would be very limited.

While developing nutrition education programmes for school children, an integrated approach had been stressed upon, earlier. Picardi and Pariser (1975), developed a food and nutrition mini course for 11th and 12th grades. This course they suggest can be incorporated in the existing high school biology or chemistry courses of the area for 4–5 weeks. The course deals with principles of food composition, health and nutrient labelling. In this course, 4 different types of American meals - drive in hamburger macrobiotic, basic four food groups and vegetables were used. The procedure involved feeding the 4 meals to weaning laboratory rats; analysing the water, carbohydrate, fat and protein contents of the meals chemically using standard analytical procedures; observation of the different biological effects and chemical composition of these foods by the students and studying the food components.
listed on the food labels. The food composition tables were used to assess the nutritional quality of the diets. The students' own dietary intake was compared to the recommended dietary allowances to assess whether their dietary requirements were met. This course was given two developmental trials and assessed by a teacher workshop. The feasibility of using such teaching methods and materials in the high schools was well documented through the study.

Two major points which emerge from this study are 1) school children appreciate a nutrition education course when it is adapted to their level of learning and (2) the children prefer to learn by doing i.e., they like to participate in a learning activity because, this helps them to relate to the activity. Therefore while developing a nutrition course for school children, the course should include age appropriate curriculum and participatory activities.

Age oriented puppet shows were a more effective medium of communication for the primary schoolers compared to other methods like flash cards, field trips and lectures. These findings were reported in a study by Devadas et al (1974) wherein nutrition education was imparted using these methods for communication.

51
Devadas et al (1973) found that elementary school children when taught nutrition using songs and flashcards got higher scores compared to other groups who had been exposed to films, drama, posters, charts, field trips, exhibitions and clay models. It is to be noted that in this study, divergent materials and methods were used for communication. Therefore, a comparison of the different materials and methods would be difficult, to give a true assessment of their effectiveness.

A study was carried out on preschoolers for 6 months. In this study, Devadas et al (1971) have reported that nutrition education was taught using songs, skits and demonstration. The findings indicated an improvement in the nutrition knowledge of the preschoolers when compared to the control group. Also, a decrease in the clinical signs of malnutrition among the children was reported.

These three studies of Devadas et al lay emphasis on the importance of a variety of age appropriate, culturally suitable modes of communication in nutrition education.

Comments on the research studies reviewed

1. From the communication effects perspective it is to be noted that, short term evaluation of all these studies, have reported a definite impact on the intended audience.
2. The studies focus on the very limited research done in India specifically on the vulnerable group of adolescents.

3. Irrespective of the different socio-economic classes, environmental conditions, a variety of teaching materials and methods have been utilized in the studies. The materials and methods used included T.V., radio, brochures, quizzes, lectures, demonstrations, posters, puppet shows, song, dramas, flash-cards and curriculum guides. Learner oriented materials, participatory in nature, within the socio-cultural context are desirable.

4. Teachers who had received training in nutrition and health education and/or nutritionists were able to draw better performances from the children.

5. The emphasis in nutrition education should be on covering a few topics intensively rather than many topics in a broad/general/less intensive frame. Emphasis on subject content at the expense of experience in the learning process would be a serious limitation in the success of nutrition education.

6. A 'carryhome effect' was observed among the school children. Cognitive experience does reflect in behaviour too.

7. School lunch programmes among the elementary school children can serve as an important front for imparting nutrition education.
8. In nutrition education, the emphasis should be on an integrated school curriculum rather than having the course as a special unit to be taught over a period of time.

9. Greater involvement by the intended target group can be achieved, provided the mode and means of communication are culture specific. The message communicated should hold a personal appeal, and, a sense of identify for the target group.

10. The studies reviewed have not explicitly stated that the various teaching materials were totally based on the interests of the target group.

11. That the need based nutrition concepts have been incorporated in the teaching materials for the target group is also not clearly stated.

Any learning situation should take cognisance of the learner, subject matter and the environmental conditions, resources available and the methods to be applied for learning. Audio-visual aids offer better opportunities to improve efficacy of nutrition education programmes. Most importantly, they should be 'need' and 'interest' based. The emphasis must be on the contemporary nutrition concerns. The educator should seek to extend nutrition knowledge by cumulative means (concepts to be included in a structural
sequence). The aim must be to modify behavioural outcomes rather than discouraging existing practices.

1.1.9 GAMES - USAGE, TARGET GROUPS AND EFFECTIVENESS

Work and play are both activities performed towards realisation of a particular objective. Effort is required in both cases. But, there are distinctions between the two activities. Work is an act wherein, generally, the time of realisation of the reward may appear at a later stage. In play, the reward is the satisfaction enjoyed during the activity itself. The difference between the two lies in the degree of enjoyment found in the activity. Putting play to work, harnessing it to a productive end would result in an absorbing interest in the activity itself, an awakening of a sense of responsibility and the satisfaction of having participated in decision making. Hence, the growing realisation of using games as an educational approach is being capitalized upon by many educators.

Play, is an activity which is non-competitive, unrestricted in itself, free, amusing or diverting. The term 'game' includes elements of co-operation, competition, and operation within a framework of rules requiring strategy and adeptness to handle all kinds of situations.
"A game is any contest (play) among adversaries (players) operating under constraints (rules) for an objective (winning, victory or pay off)" Clark Alt (1968) as quoted by Ellington et al (1982). This definition of a game is accepted by a majority of educators. The definition identifies three essential features:

1) Overt competition of some sort should be there,
2) the exercise must have rules,
3) objective should be kept in mind.

Games provide imaginative and experiential learning situations. They make learning more meaningful.

1.1.9.1 Usage of games. What is the expected outcome of the game, in terms of the player and developer of the game? The expected learning of the participants depends on various factors and involvement of some philosophies evolved by the game designer. The control exercised by the instructor on the intervening variables along with the player's behaviour, expectations, sustained interest and motivation, elements of creativity, surprise, reinforcement unitedly contribute towards making or marring the game.

1.1.9.2 Form/type of experience. No two individuals are alike. The outcome of any one game experience would have to be viewed in his/her own context, outlook and experience.
Bredemeier and Greenblat (1982) have emphatically stated that the "shape" of the experience varies from person to person.

"The tendency to think and write about the learning from the experience of a game must give way in the first place to recognition, that, what anyone learns from any experience depends on a host of circumstances: what the person is looking for; the detailed 'shape' of the experience, the nature of the person, opportunities to practice, similarities of that experience to other experiences, the intrinsic pleasantness, unpleasantness of the experience. Such variables obviously affect what we all learn from any experience .... a simulation game".

The game experience will depend on (i) game administrator and designer, (ii) format of game (iii) time of play, (iv) other participants, and, (v) incentive offered. Smith (1987), Bredemeier and Greenblat (1981) have stated that all these variables affect the game experience.

The hard evidence favours simulation gaming over conventional methods with respect to retention of what is learnt. Pierfy (1977) surveyed eleven studies where simulation gaming was used to assess retention of learning. This was done by administering the post-test a second time, considerably after the first administration.
Of these 11 studies, in eight studies, retention was significantly better with simulation gaming, while in 3 studies, no difference was observed.

1.1.9.3 **Content of the game.** Several educators have stated that, if, the content of a game does not truly represent the reality, it is supposed to represent, participants may enjoy the game experience, but cannot be expected to learn the "right things" from it. The content must therefore reflect the needs of the target group concerned.

1.1.9.4 **Measurement of variables.** Bredemeier and Greenblat (1981) speak of three main categories of variables, which can affect the games. They are:

1) substantive learning, which may be either cognitive or affective/evaluative learning, and, may entail learning about the self or about some external subject matter or phenomenon.

ii) Motivation to learn about something and,

iii) the nature of student-teacher relations — what might be called the "atmosphere" of learning.

Implicitly, the last two claims are linked to further hypothesis that motivation, and atmosphere affect substantive learning and call for further investigation.
1.1.9.5 Educational factors of games. Games are claimed to facilitate behavioural skills such as acting ability (Gygax, 1978 as quoted by Fine 1981) decision making (Sutton-Smith, 1976 as quoted by Fine, 1981) leadership and role playing.

Games provide the satisfaction of having performed an act rightly, and, the knowledge that one can do something. Games also lend a personal insight to an individual regarding his/her capabilities. Improved socialising ability, and incisive enquiry are also facilitated through games. Educational simulations are particularly important for transferring learning in processes such as communication, decision making, conflict and the like (Saunders, 1986)

Games are specially relevant to skill development. Cunningham (1984) states that it is probably not possible to understand fully or define fully the specific skills learned, especially, since individuals will gain different insights from the simulations. He felt that learning may require feedback to 'unfreeze' the individual's behaviour and provide reinforcement of the change.

Games as learning exercises involve assumptions such as learning through doing.

1.1.9.6. Experiential learning through games. Games are accompanied by an optimal level of emotional arousal
compared to the emotionally neutral environment of the habitual classroom. Simon (1983) as quoted by Eowen (1987) has stated that, "(M)ost human beings are able to attend to issues longer, to think harder about them, to receive deeper impressions that last longer, if information is presented in a context of emotion - a sort of hot dressing than if it is presented wholly without affect."

Man is by nature an emotional being, and seeks an experience which calls for personal involvement. This in turn, would result in satisfaction of having experienced a situation. Learning is a definite outcome of any experience. Whether the learning progresses towards intended or unintended consequences, will therefore depend on the mode of communication and its presentation.

1.2 Considerations in design and conduct of experiential learning

1.2.1 PRINCIPLES

Bowen (1987) has enlisted certain principles for the design and conduct of experiential learning. Some of the essential principles include -

an optimal level of emotional arousal, uniqueness of game experience to each individual, a safe learning environment, reduced risk to foster learning and approach of the instructor.
The fact that a learning activity may lead to expression of strong emotions, does not necessarily preclude, and may indicate that its use is appropriate. The use of experiential learning simply to amuse or entertain has been discouraged.

A combination of learning techniques is probably best, as no single approach is equally applicable for all topics, instructors or students.

1.2.1.1. Barriers to playing games in schools. Saegesser (1984) has expressed the main barriers for designers of simulation games for introduction in schools as follows:

i) the schools' limitations on time, space and programme content, which act as constraints for building models of games,

ii) the school environment itself, which favours games that are "heavily parametric from the outside" and encourage instrumentality.

iii) Belittling of games that allow a lot of play and show an abiding faith in the creativity and ingeniousness of the pupils.

In short, the quality of the games designed should not be exclusively determined by the present organisational
'needs' of the school. Games can be successfully adopted as learning exercises in nutrition education; especially for an exploratory, sensitive and young group, who are on the lookout for interest based activities, calling for a sense of personal involvement.

1.3 Nutrition Games

1.3.1 NUTRITION GAMES FOR THE COMMUNITY

Pizano (1980) has called for 'revising' the traditional methods of teaching, making them more successful through a multimedia approach. This would assure wider coverage and greater impact for the least cost. Using games would be one such approach.

In many parts of the world, games have been developed by several organisations and individuals (Show and Tell, Unesco, 1985). Games published by some of the organisations and individuals include those by Carrington et al (1987), Stuckey and Thompson (1987), Griffiths and Manoff (1985), Unesco (1984), Werner (1983), Save the children Federation (1982) and Raimbault (1981). The content in these games covers both nutrition and health aspects. Most of these games have been suggested for use in the community and the primary school. Usage of these games in secondary schools has also been suggested.
In the Indian context, certain institutes like the NIN, NIPCCD, VHAI, Institute of Home Economics and Chetna have also published Nutrition and Health Games. Devadas et al (1985) have mentioned the use of games in nutrition education. The games put out by these institutes and individuals have been suggested for use in the community at large, as supplementary educational materials. By and large all these games have been stated to be useful in community education. While this is encouraging, it is also pertinent to note that no study has been reported, wherein specific nutrition games have been developed only for the adolescent group. Research studies, wherein a set of games have been evolved, introducing the content in a structural sequence, based on the popularity of the games, needs and interests of the adolescent group are sparse.

A few studies are reviewed, wherein, nutrition games have been developed for preadolescent and adolescent groups.

Spitze (1976) conducted a nutrition education programme in a home economics course for the school going adolescents. She used games in addition to other discovery teaching techniques like quiz, skit, cafeteria models for the experimental group. There was no control group. The learning activities for 55 high school students were for 10 days. A pre and post knowledge test was
conducted. Evaluation was also carried out on the basis of opinionnaire and anonymous letters received from the subjects. The post test results were favourably inclined towards the subjects. They were of the opinion that learning nutrition would be interesting provided, varied teaching techniques are used. Though nutrition education improved the knowledge status of the subjects, certain misconceptions persisted regarding nutrition functions, requirements and food sources. These misconceptions had to be cleared by further education.

Wodarski et al (1980) developed two nutrition units - one each for the elementary and secondary students. The Teams Games Tournaments (TGT) teaching technique was incorporated in the nutrition units for students at the elementary and the secondary levels. The units provided a basic introduction to nutrition with daily lesson plans, general nutrition concepts, with objectives, referenced subject matter, learning experiences, resources and materials. The information was presented by inquiry, discussion and discovery learning experiences. This was in turn reinforced by daily skill drills in the form of games. The topics covered were based on previously reported food and nutrition needs and interests of the students.

In the TGT technique, on the basis of the pretest scores, the students were divided into heterogenous teams
of 4 member each. Each team had one high achiever, two average achievers and one low achiever. For each tournament game, one student from each team competed against students of comparable achievement levels from other teams. Based on points earned, each student moved to a table with higher or lower performing students for the next tournament. At the end of the tournament, the points earned by each member of the team were added to compute the team scores.

TGT units were presented for 45 minutes/day for 3 weeks to 47 sixth grade students. The information was presented for a period of 50 minutes per day for 4 weeks to 36 tenth to twelfth grade students. No control group was maintained.

The first three days of each week was devoted to learning the concepts through demonstration, discussion and other participatory activities. The fourth day, the subjects worked in TGT teams in preparation for the tournament for the next day. Scores were tabulated and posted on the sixth day.

Significant increases in nutrition knowledge were observed in both sixth grade and high school classes. The students enjoyed working in groups and in participatory learning experiences.
The emphasis in this study was on team co-operation and competition. While this is important for learning, other facets to such an approach need to be examined. The categorisation of students into low, average and high activities could be discriminatory, because each student is given a label. This labelling would cause a fear of failure, of not measuring up, possibly even social insecurity. All this, would probably have a demoralising effect on the sensitive vulnerable, adolescent. A study of retention of the knowledge acquired through this technique would have been interesting. Whether acquisition of knowledge of nutrition had affected their food choices would also have been quite pertinent to study.

Cuffaro and Shymko (1980) carried out a project to assess the effectiveness of a nutrition education unit for preadolescents (12 years old). The subjects were drawn from 2 city elementary schools in eastern Canada. One experimental and control groups were from the same school. The second experimental group was drawn from the other school. Both the experimental groups were given the same nutrition information through lecture method. They completed the same dietary record assignment. In addition, one of the two experimental groups, of 30 children actively participated in a variety of competitive word and board games. The other experimental group of 23
children was presented with audio visual materials. The classes were presented for one hour each week for 6 weeks.

The results of post-test for nutrition knowledge indicated a significant gain by the two experimental groups compared to that of the control. But, between the two experimental groups, no significant difference was observed. Major limitations of this study are that the control group and experimental group receiving audio-visual materials were in the same school, which may have caused interaction between the two groups. The groups were not well matched. One group had less than average vocabulary in English compared to the other two groups. Therefore, the pretest scores of one of the experimental groups, which had games, were much lower than that of the control group and the second experimental group.

It could not be determined to what extent the games or the audiovisuals had contributed to the gain in knowledge. Both the experimental groups had lecture and supplementary materials in the form of either games or audio-visual aids. Field testing of the materials would perhaps have made a difference to the results. That the materials were pretested prior to the final experiment has not been clearly mentioned by the authors Cuffaro and Shymko.
Dodds (1983) reported about a nutrition education project for schools in Massachusetts. In this project a new curriculum was developed by two high school teachers and an environmental educator in a Somerville public school. This new Health and Nutrition curriculum covered the existing lacunae in the curriculum for the junior school (8-10 yrs) and high school (12-13, 14-16 yrs) students. This new curriculum included text books designed with cartoon type pictures, teachers hand book, video tapes and games.

Of the fifteen teachers, who had received training for handling the new curriculum, only 3 had implemented it in class. The need for new models for learning nutrition was expressed. The author concludes that nutrition curriculum for high school students has been sparse and often very technical as in a science course. Food preparation is over emphasized and food selection is hardly discussed.

Sleet (1985) carried out a study to assess the effect of two nutrition card games, on the students' attitude towards, and knowledge about human nutrition. The sample consisted of 66 junior high school students (6-8 grades) and 73 high school students (9-10th grades) in California. The games were selected due to their educational potential and popularity in nutrition education programmes. The nutrition knowledge tests were those developed by a
commercial firm (Pillsbury Co). The questions related to the nutrient content of various foods.

Half the class in each grade was randomly assigned to the experimental group and the other half to the control group. After introductory instructions, the experimental groups played the card game in groups of 5 persons for 30 minutes approximately.

The high school students and one section of the junior high school students were post tested immediately after exposure to the games. A subsample of junior high school subjects were post tested two days later for retention. This was done to examine the 'persistency of learning'. A significant gain in learning was observed in this group as against the control group. Analysis of the degree of improvement between the experimental and control groups showed significant gain in favour of the experimental groups.

The results of the study illustrate that selective nutrition games, when used in a judicious fashion can significantly improve knowledge. This knowledge persisted through the two days after which the retention test was done. However, in one instance, there was an actual decrease in knowledge score from pre to post test, though insignificant. Nutrition games, therefore, may not necessarily have the same effect on learners drawn from
different age groups. Though, both girls and boys had been included in the sample, differences in performance between sexes was not reported. The nutrition games and tests used in the study were commercially available. They had not been specifically developed on the groups' interest and nutrition knowledge needs. This study used only 2 games and compared their effectiveness on two different age groups. No two individuals being alike, the games appealed in varying degrees to the two age groups. The study emphasizes the need to evolve a variety of nutrition games to attract attention and motivate learners to acquire nutrition knowledge.

Studies such as these in the Indian context, are sparse. A variety of games based on the nutritional needs and interests of the adolescents have not been tested in the process of nutrition education.

The major points which emerge from the review of these studies using games for learning are:

1) Adolescents are willing to receive nutrition education provided appropriate teaching/learning techniques are employed.

2) Thus far, whatever nutrition games have been developed are for the combined group of pre-adolescents and adolescents.
iii) To sustain the interest and to motivate the adolescents for nutrition learning, a variety of games need to be developed.

iv) Specific nutrition games developed in a structural sequence in terms of playability and subject content, for the adolescent group are sparse.

v) Studies wherein, nutrition education was imparted using games in addition to other learning activities are also limited.

vi) The outcome of a study where learning is only through games would be very interesting.

vii) Studies on adolescents, wherein, comparisons between sexes and across mediums of instruction were made are almost non-existent.

viii) The efficacy of using games as a learning medium, in adolescents belonging to different socio-economic groups would be quite revealing.

ix) Whether nutrition learning through games only leads to retention of the knowledge requires to be explored.

Wide socio economic disparities exist among the Indian population, a majority of who live in the rural
areas/urban slums. Various developmental, intervention programmes are operated to take care of the malnourished, vulnerable segments of the population. The focus is on the expectant and nursing women and children (0-6 yrs). The vulnerable adolescent does not figure prominently in these programmes. The programmes provide a package of services such as supplementary food, immunisation and other related welfare measures. Though education is a component of all the programmes it lacks the strength of effective implementation.

The Indian Government has launched a national technology mission (Government of India, 1989) with emphasis on national literacy, both functional and otherwise. The aim of the mission is to develop programmes for community participation, making use of local resources promoting self-reliance. This would truly sustain human resource development.

In this mission, the Government of India has called upon the youth to participate to achieve the objectives of this literacy mission. The youth groups are visualised as important change agents, who would convey welfare messages to the family and community. Therefore, emphasis should be laid on nutrition education of school going adolescents, who have the potential
to improve the 'quality of life', but do not do so for lack of information or motivation.

The importance of education for human resource development is undeniable. The educational technology utilized for development in India must take cognisance of the three major resource constraints - time, money and knowledge. A nutrition education programme in India should suit the cultural context, draw on the local resources, include interest-based, need-based, participatory activities for the target group. Use of games could be one such approach.

In a developing third world economy as in India, nutrition education of the adolescents using low cost, indigenous resources and interest based activities like games are significant.