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RESEARCH REPORTS

Children's understanding of food and health in primary classrooms

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This article describes an action research project involving primary teachers on in-service teacher education programmes in London. The purpose of the research was to promote teachers' understanding of the relationship beween research and classroom practice and thereby to identify ways to promote teaching and learning in science. The research aimed to investigate children's knowledge and understanding about food and diet. Teachers interviewed children aged from 5 to 12 years. Pictures of food were used to identify how children choose food to eat and how they classify foods, and to explore their understanding of nutrients. The findings suggest that even five-year-olds have some understanding of the relationship between food and health. Children also hold alternative ideas about food, especially about the function of food and the importance of specific nutrients. The research helped teachers to reflect on their practice, to develop new strategies for teaching and to evaluate learning experiences more effectively.

Introduction

The past decade has witnessed major changes in education policy and practice in science education in the UK. The implementation of the National Curriculum (DES 1989, 1991) presented those involved in science education in England and Wales with new challenges and uncertainties. For the majority of primary teachers science represents only one of the subjects that they are expected to teach as part of the National Curriculum. It is also a subject that causes specific difficulties. Reasons for these difficulties have been identified by Her Majesty's Inspectorate (HMI) (DES 1978, 1983, 1985), including the low level of science teaching expertise in some primary schools. It appears that primary teachers will require continuing support if they are to teach science with confidence as part of the National Curriculum. Such support would include adequate resources allied to ongoing programmes of in-service (INSET). In-service provision for science in primary schools over the past ten years has expanded to meet the growing pressure to develop appropriate teaching and learning activities. The extent of this provision and some of the positive outcomes are evident from HMI reviews of teaching and learning science (for example HMI 1989).

This paper describes activities linked to research that have formed part of in-service courses in science education for primary teachers at the Institute of Education, University of London. The research activities have a number of purposes. These include the investigation of ways in which teachers can be helped to develop and to extend their skills in teaching science, including assessing and monitoring the progress of pupils. The activities also seek to provide opportunities

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for teachers to reflect on their practice in ways that will help them to develop professionally. However, before changes in teaching practice occur, teachers need to be convinced of the usefulness of research findings. Attempts to bridge the perceived gap between 'research' and classroom 'practice' are not new. These attempts are the basis of action research, which Cohen and Manion (1986) have described as the investigation of particular contexts, with practitioners and researchers working together as a team. The context for the research described in this article is the investigation by teachers of the ideas which children have about food and health. The ultimate goal of such research is to improve teaching practice.

Background

During the past two decades there has been considerable research into children's understanding in science. However, to date there has been limited research into children's understandings about food and health.

Holland (1979) investigated the ways in which children from eight to ten classified food items. Her study indicated that home background was important in determining whether the classification system used was context-independent or based upon practical experience. The work of Newsome (1983) with secondary pupils in London schools provided further evidence about the types of classification systems used by young people. Newsome's finding that classification systems taught in schools are rarely used by pupils when they are allowed to group foods according to chioce is consistent with work with primary school children in the USA (Contento and Michela 1981) and in the Netherlands (Edema 1985). The research findings suggest that the food systems used for teaching are not fully understood by pupils or are perceived not to be relevant or useful in everyday life; what is taught does not becomes part of what Barnes (1976) has termed 'action knowledge'.

There have been a number of studies that have provided evidence about young people's understanding of the function of food and the importance of specific nutrients in the body, for example Contento (1981), Wellman and Johnson (1982), Magarey *et al.* (1986), Resnicow and Reinhardt (1991), Brinkman *et al.* (1992). These studies have indicated that although children may recognise particular nutrient terms, children below the age of 11 have little understanding of the function of nutrients in the body.

The research described in this article, an investigation of the ideas that children from five to twelve have about food and diet, was located within a constructivist paradigm (Driver 1981, Driver and Erickson 1983, Osborne and Cosgrove 1983). The research is important in the context of the school curriculum, for the teaching of subjects such as science in a multicultural society and as part of cross-curricular themes such a health education (NCC 1989). It is important also in the context of wider discussions about children's diet and health (WHO 1990). A further dimension of the research was its role in the professional development of teachers. One of the aims was to provide contexts permitting debate and reflection about teaching strategies and curriculum development as well as enabling teachers to review and update their own ideas about food and diet.

The article focuses on two aspects of the research: the study of children's ideas of food and diet; and the outcomes of the study for the teachers involved.

The study

Seventy primary teachers taking in-service courses participated in the research programme from 1988 to 1992. The teachers were working in schools in Inner London, the outer London boroughs and Essex. The schools represented a cross-section of schools in the London area in terms of buildings, situation, size and the background of the pupils.

As part of their course each of the teachers undertook a small-scale research project that sought to investigate children's knowledge and understanding of food and diet in relation to food choice. Teachers interviewed three children in their own class to investigate their understanding of aspects of food and nutrition. Three children were thought to be a manageable number in view of the time constraints. An important concern in a study of this type (involving a large number of interviewers) is to reduce inter-interviewer difference. In this study differences between interviewers were reduced by having the teachers undertake trial interviews with the author. These preliminary interviews were taped and mutually analysed before teachers undertook work with pupils.

Following the interviews with their pupils the teachers discussed their findings as a group, commented on the activities and raised further questions. Copies of the recording sheets completed during the interviews, plus tapes and notes made during the interviews, were used to identify ways in which the data could be analysed. Teachers then prepared written reports on the activities; these reports formed one of the assignments for the course. Feedback to teachers included comments on both draft and final reports plus a report written by the author which summarised the findings from the group (Turner 1989). The implication of the findings for teaching, including planning for teaching science and technology, topics related to health education and assessment of pupils, were considered during group discussions.

The analysis and discussion of the process and outcomes of these interviews formed part of a critical, reflective review of children's learning of scientific concepts by the teachers that included consideration of the implications of such studies for teaching science in primary schools. The writing of reports based on the interviews provided teachers with opportunities to reflect on their practice in ways identified by Schön (1983, 1987).

Interviews with children

The structured interviews were designed to find out what types of food children choose, why they make the choices they do, how they group foods, what understanding they have of specific nutrients and the reasons they give for eating food. The interview structure was developed by the author as a result of earlier work in other schools (Turner 1992). The use of pictures and the form of questions in the interviews were similar to those reported by Osborne and Freyberg (1985).

The interview structure was designed to provide a framework that would enable the results to be analysed but which would not hinder more extended discussion. It was particularly important that the children being interviewed did not feel that the activities were a test. The activities also had to be appropriate for teachers to use with pupils from five to twelve years. Finding time to talk with individul pupils was not easy in a busy schedule so the interviews had to be

designed so that they could be accomplished in not more than thirty minutes. The discussion was recorded by: summary notes made during the interviews, using prepared recording sheets; notes made following the interviews; and tape recordings that were transcribed.

The simple outline pictures used during the interviews illustrated food items that were familiar and easily recognised by primary children, for example fruit and vegetables, bread and cereals, meat and fish (figure 1). The items were selected on the basis of earlier trials in culturally diverse schools. The cards included pictures of sweets, biscuits, chips and crisps, which are known to be foods commonly consumed by children (Department of Health 1989). A maximum of thirty cards was used. Work with teachers in the trials had indicated that thirty cards was a suitable number to use with pupils from seven to twelve, although 20 was more appropriate for most five- and six-year-olds.

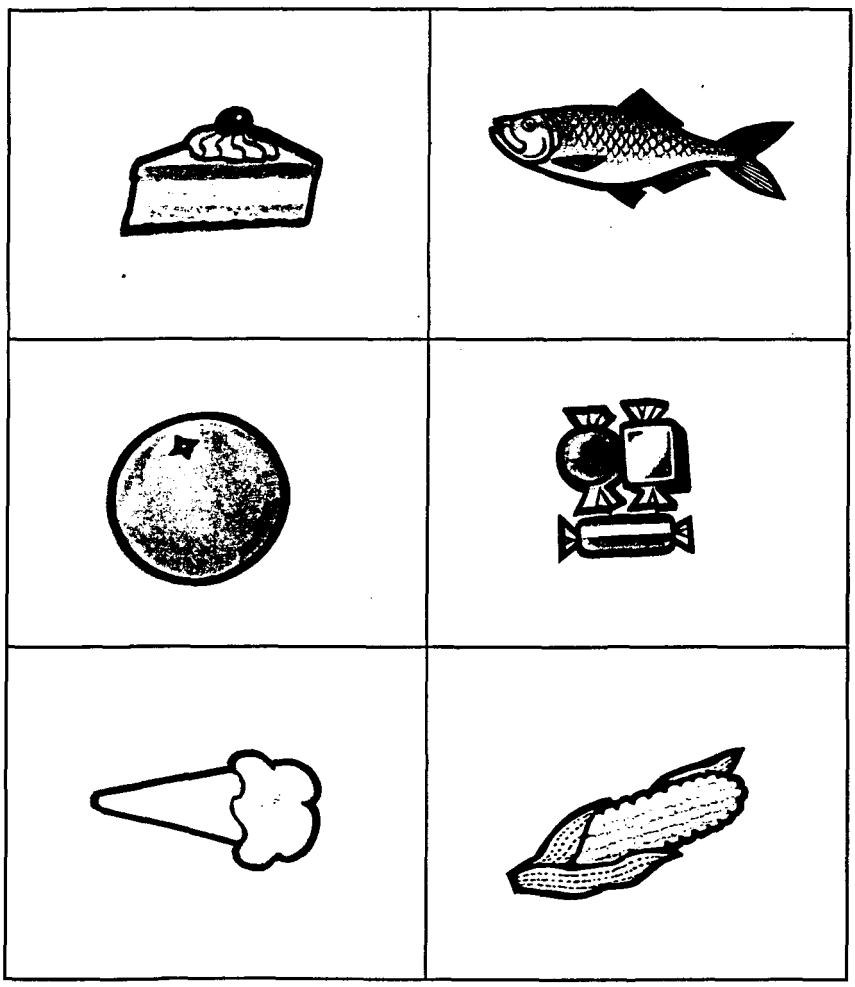

Figure 1. Examples of pictures of food used in food grouping activity.

At the start of the interview children were shown the cards, allowed to handle them and encouraged to talk about the foods depicted. Any foods which they did not recognise were put to one side. The name given to the food by the child was accepted—many children, for example, interpreted the picture of a bread roll as a hamburger, some identified the biscuit as a chapatti.

Activity 1: Food grouping

After becoming familiar with the cards the child was asked to place them into groups. The reasons for the groupings were elicited.

Activity 2: Food choice

Children were asked to select foods for breakfast, lunch, tea/supper, plus snacks. The cards were used as a basis for the selection although the children were told that they could choose additional foods or drinks if they wished; they were also allowed to use each card more than once.

Activity 3: Knowledge of nutrients

Cards with the names of nutrients (fat, fibre, minerals, protein, salt, sugar, vitamins) were shown to the children who were then asked a series of questions to find out if they had heard (or seen) the word before, what they thought the nutrient was and whether they could give examples of foods with these nutrients in them. The pictures of foods were used as prompts. The order in which the cards were shown to the children varied; it was suggested that teachers start with words which children had used spontaneously in earlier activities.

Activity 4: Why do we eat food?

Discussion about the reasons for eating food was initiated by posing the question 'Can you tell me why you think that we need food?'

Children's knowledge about food and diet

The interviews provided both qualitative and quantitative data about children's understanding of food and diet.

Activity 1: Food groupings

Eight categories of groupings were identified:

1. Classification based on groups of foods such as fruits and vegetables;
2. Groupings based on associated foods, for example bread and jam, fish and chips;
3. Meal groupings;
4. Healthy/unhealthy;
5. Physical attributes of food, for example taste and colour;
6. Liked/disliked foods;

7. Food source, for example where brought or grown;
8. Alphabetical or numerical grouping.

The number of children using different groupings is shown in figure 2. The majority (69 per cent) of the 212 children interviewed, used a mixture of food groupings which included some form of food classification allied to a system where associated foods were grouped together. Fewer pupils (32 per cent) used a meal grouping system, although many foods grouped in pairs, for example chicken and rice, could be interpreted as what is eaten together as part of a meal. Pupils below the age of eight were most likely to use groupings such as like/dislike, colour, shape, taste, texture. Healthy/unhealthy groupings were only used by pupils aged eight years or above.

The foods most commonly classified were fruit and vegetables (figure 3). The next most common grouping was one based on sweet foods (65 per cent), followed by meat or fish (37 per cent) and drinks (28 per cent). Groupings based on bread and cereals, and milk and dairy foods were infrequent, especially below the age of eight. Only three children, aged eight to ten, used a system based on nutrients. Study of the topics taught in the previous six months indicated that prior teaching about food had had little effect on the types of food groupings used by individuals, a finding that is consistent with other studies, for example Newsome (1983).

Children below the age of seven were less likely to use groupings based on classification. However, further work with younger children (Turner, 1992) suggests that even four-year-olds can categorise foods, for example as fruit and vegetables, when they are given food items rather than pictures to group.

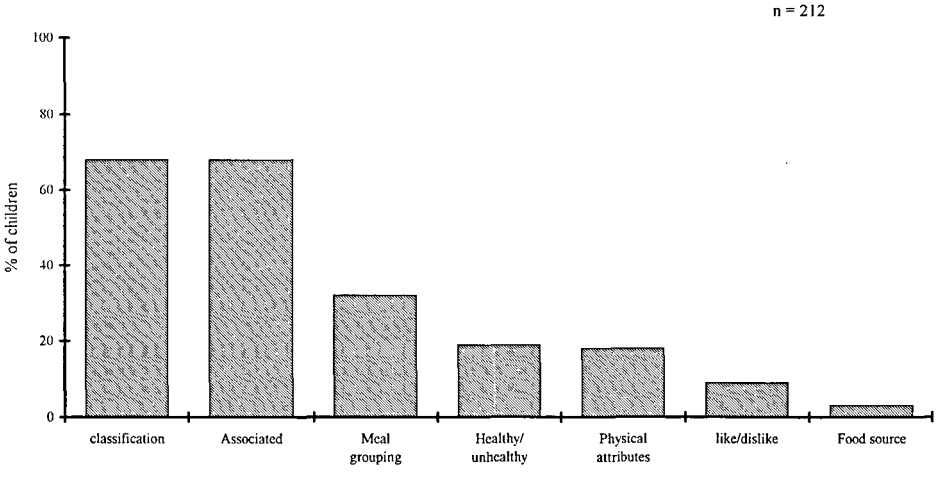

Figure 2. Food groups used by children.

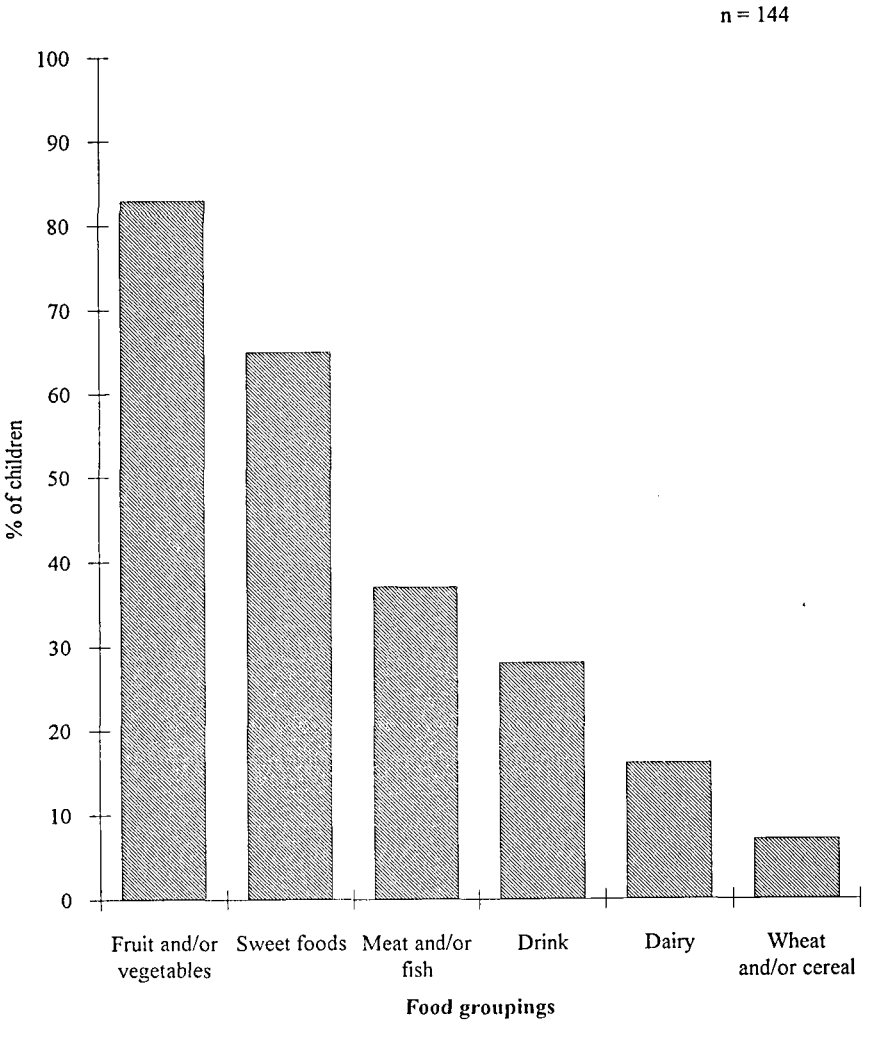

Figure 3. Classification systems used by children.

Activity 2: Food choice

The data collected provide information about the choices made by children based on the cards used during the interviews; it was not the intention to collect information about what children actually ate. However, the findings do provide indications of the sorts of foods which children might select if given freedom to choose. In making their choices children usually chose those foods that they said they normally ate at home or for school lunches and which they liked or considered to be favourite foods. A minority cited health reasons for their choices. There was little difference in the selections made by girls and boys or those made by children of different ages or different ethnic groups.

Cereal and/or bread (often as toast) was the basis of the breakfast chosen by all but four of the children. The majority of the children made choices based on the

pictures, or their interpretations of the pictures; few children (these were normally older than nine years) extended the foods chosen to other food items, e.g. samosas or pizzas. Some teachers expressed disappointment that their pupils' food choices for meals were so sensible and ordinary! Surprisingly the most commonly selected snack items were fruit or vegetables such as carrots. However, this choice may have been influenced by the fact that teachers were doing the interviewing. The next most popular choices were crisps (36 per cent) and sweets (30 per cent) (figure 4).

On occasion children were very perceptive about their choices, for example R (aged eight), in giving reasons for choosing beefburger and chips for supper, explained: 'If you fry it, it isn't good for you, but if you like it, you want it'.

The comments on snacks were revealing, for example:

'What I am allowed'.

'I eat these on the way to school'.

'If you had too much you wouldn't eat your dinner'.

'I like all these. I know they're not good for me'.

Activity 3: Knowledge of nutrients

The number of children recognising particular nutrient terms is shown in figure 5. The majority had heard of sugar, salt, fat and vitamins, and could give examples of foods that contained sugar, salt and fat. The idea that vitamins as tablets/pills equated with health, or as being good for you, was widespread. Words like fibre, minerals and protein were recognised by about half the children. Minerals were related to vitamin tablets or to mineral water: 'They are like vitamins, good for you' was the most common response.

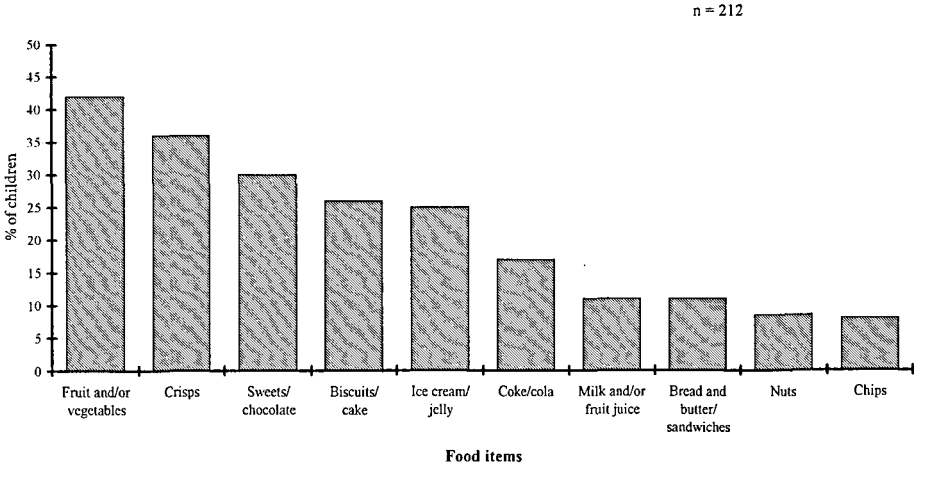

Figure 4. Food items selected as snacks.

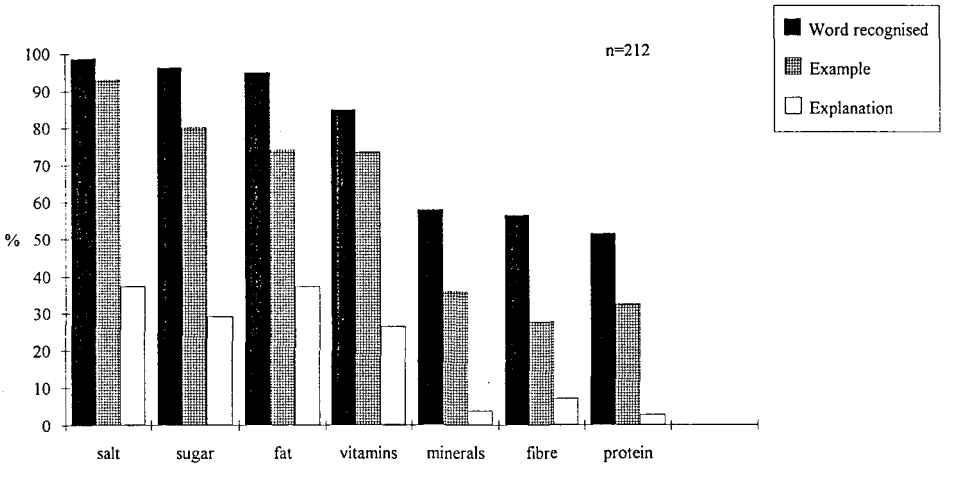

Figure 5. Children's ideas about nutrients.

Few children could provide explanations of the functions of specific nutrients in the body, a finding that is consistent with other studies (Magarey *et al.* (1986)). Children who had special dietary requirements, such as those with diabetes, were better informed about particular nutrients and were more aware of the constraints which govern food choices. Not unexpectedly explanations about fat, salt and sugar were more common than other terms and it was possible to categorise these explanations. A general finding was that older children gave more detailed explanations.

The categories of explanation for fat included:

	*Number of responses (n=62)**
Part of food, e.g. meat, bacon	43
Grease or oil	13
Fat associated with fatness in people	12
Eaten as part of the diet	4
Substance used in cooking	4
Other (general statements)	5

*Some children gave responses that fitted more than one category

For the majority of children of all ages fat was recognised as something that was present in particular foods and could be seen, for example, 'It's on bacon and it's all white and it's all wobbly'. In many instances fat was regarded as unhealthy. Only two children recognised that some fat was needed in the diet and that it was the amount of fat eaten that was important in determining whether fat was 'bad for you'.

The majority of the children who provided explanations about salt and sugar regarded them as substances that were added to food to provide, or enhance,

flavour rather than as constituents or ingredients of particular foods. Their function in the body was rarely mentioned.

Salt was described as:

	Number of responses (n=79)
Description of appearance (small white grains/ crystals/powder)	14
Salt as small white crystals added to food during cooking or when eaten to give flavour	57
Salt as constituent of food	2
Function in the body e.g. water regulation	6

The categories of responses for sugar were similar:

	*Number of responses (n=79)**
Description of appearance	23
White substance used in tea or coffee or on foods e.g. cereals, to improve taste	47
Plant origins	4
Function in the body, linked to energy	6

*One child gave responses that fitted more than one category.

Activity 4: Why do we eat food?

This question was posed during the interviews when the topic was not broached by children. The predominant reasons given by children were general statements that are related to:

- life and/or death
- growth
- strength and stamina
- health
- energy
- satisfying hunger.

These statements can be subdivided into three groups:

1. positive reasons, e.g. 'to keep us alive'.
2. negative reasons, e.g. 'If we didn't eat we would die'.
3. mixed response which included positive and negative reasons, e.g. 'To keep you healthy and keep you going . . . if you don't eat any [food] you could die' (girl aged nine).

The proportion of children giving different responses is illustrated in figure 6. The majority of children (54 per cent) gave positive reasons for eating, a further 17 per cent gave a mixed response and 28 per cent a negative response. Remarkably few children (less than 6 per cent) mentioned hunger, which is perhaps not surprising in a country where food is readily available and where it appears that many children eat snacks between meals (Department of Health 1989). There was little difference in the responses given by different age groups or between those given by girls and boys: children above the age of eight tended to make more detailed statements. Although the number of children involved was not large the responses were consistent with those obtained in other studies, for example Magarey *et al.* (1986).

The findings indicate that even five- and six-year-olds may have considerable knowledge of food and diet. The importance of the home was very evident; many younger children in explaining why they ate particular foods stated that it was eaten because their parents said it was good for them. The influence of friends, the media and medical practitioners was also apparent, as was the case in a later study by Mauthner *et al.* (1993).

Children of all ages frequently commented on foods chosen for meals or snacks as being 'good for you'. It appeared that some children, even as young as six, understood that specific nutrients, notably fats and sugar, have effects on the body and recognised that foods that were sweet should be eaten only in small quantities. Children also recognised the need for variety and balance in diet, something that was reflected in their choices of food items for meals and the comments that they made concerning these choices.

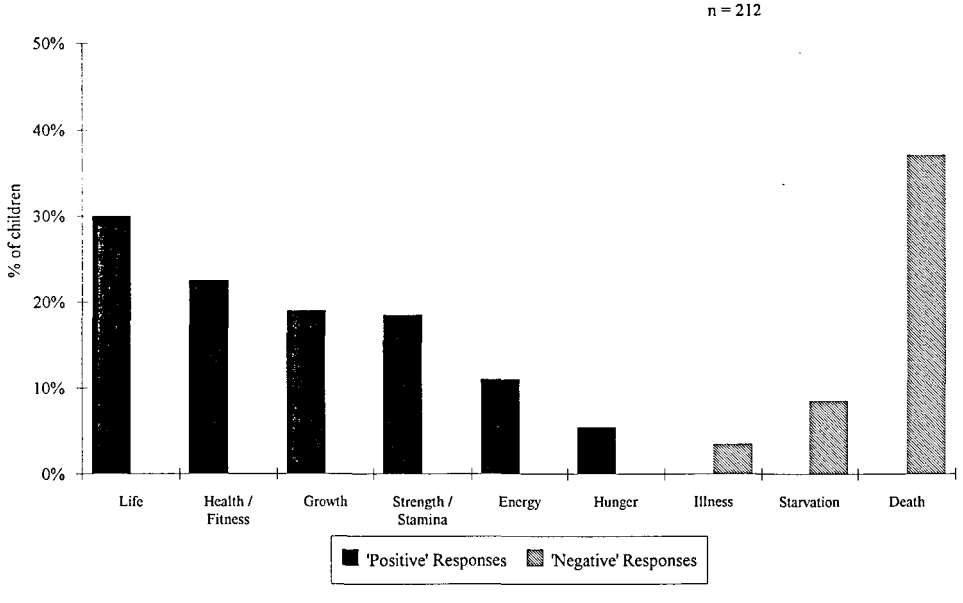

Figure 6. Why do we need food?

Although relatively few children spontaneously placed food into healthy or unhealthy groups during the first activity, many children identified foods that were healthy during subsequent discussions, particularly when choices were being made for meals. Those children who did group foods as being healthy or unhealthy made selections which accord with current views of health. Thus, foods containing sugar and fat were considered 'bad for you' and those containing fibre and vitamins were 'good for you'. These findings are consistent with other studies, for example Osborne *et al.* (1992) and Mauthner *et al.* (1993). Cheese was the only food item high in fat that was characterised as healthy, an observation that is consistent with studies with older pupils (Brinkman *et al.* 1992) and which may reflect commonly held views about the importance of dairy products.

There were a number of areas where children's ideas were at variance with those of scientists and nutritionists. Lack of understanding about specialist nutrient terms amongst primary school children is not surprising. For most children words like protein are unfamiliar and therefore not understood. However, there were other ideas that children held that merit comment and which have implications for teaching, including:

- the categorisation of salt and sweet foods;
- vitamins as pills or tablets;
- lack of understanding about fibre in the diet.

The inclusion of crisps, and more rarely chips, in food groups designated as sweet and otherwise containing only sweet-tasting foods, such as biscuits, was common to all ages. A third of the 94 children who created 'sweet' groupings in this study included crisps in their choice of foods. Some children also included crisps in their examples of foods that contained sugar. In some cases children explained that they were including crisps amongst sweet-tasting foods as both were unhealthy. Grouping of this type by other children, who proffered no explanation, could also be the result of such reasoning. A further reason could be that crisps and chips are regarded as 'nice tasting', in the same way as sweets, and are therefore categorised as sweet. In some instances it appeared that children were not using the word 'sweet' in the accepted sense, perhaps because of language difficulties. When children talked about sugar and salt they frequently commented on the similarities between the two substances, in terms of appearance as 'tiny white crystals', or the way in which they were added to foods to make them taste 'better'. Both salt and sugar were perceived as 'bad for you'; teeth were often mentioned in this context. Some of these points were clearly illustrated by the twelve year old who said:

> Sugar, it's like salt, this sort of salt looks like tiny crystals and they're in different types of food... similar to sugar but salt comes from the sea, just like sugar, these crystally things. Salt is not that good for you because it can spoil your teeth... if you are eating food and it doesn't taste right we put salt on to make it taste better.

One third of the children interviewed described vitamins as pills or tablets taken to keep them healthy, a minority recognised that vitamins were substances 'inside' food that were needed for the maintenance of health. This finding, which matches observations made in the United States (Contento 1981) and Australia

(Magarey *et al.* 1986), reflects general views about health and the function of vitamins in the body and can be linked to the widespread consumption of vitamin pills.

During the past decade the importance of fibre in the diet has been stressed by nutritionists and dieticians, as well as the food industry and the media. Over 50 per cent of children recognised the term fibre and most of these could provide examples of food that contained fibre. Cereal packets were a frequently quoted source of information. However, the majority of children held very confused ideas about fibre. Only eight children were able to give any accurate explanation of what fibre was or its possible function in the body; these included graphic descriptions about 'cleaning you out'. For some fibre was equated with money 'like it's some money' (clearly they had misheard or misunderstood and thought the word was 'a fiver', a five pound note). Others equated it with drinks.

Although the presence of fibre in food can be demonstrated readily, this is more difficult for other substances like protein. It was understandable therefore that terms like protein and minerals posed difficulties for children, even when they had been taught nutrient terminology. It appeared from the study that a surprising number of schools were teaching pupils about nutrients in the final two years of primary school. However, only two children had any real understanding of the function of protein and fibre in the body.

Outcomes of the research for the participating teachers

There were a number of important outcomes of the study for teachers in addition to the insights gained about children's ideas about food and diet. These outcomes can be divided into two categories: issues concerning teaching and learning, and personal knowledge and understanding about food and nutrition.

Issues concerning teaching and learning

The importance of the findings for teaching and learning for teaching in science, not just food-based topics, was identified by all the teachers who participated in the study. Many teachers reported that they had found the activity of finding out what children understood particularly helpful and would use the strategy as a starting point for teaching about food in the future. One teacher, summarising her interviews with children, wrote, 'One-to-one discussion with children about their ideas, or carefully observing a child performing an investigation, is particularly valuable as it has implications for more meaningful learning'. Another concluded, 'The object of this study was to discover some of the ideas children might hold concerning food and diet. The implications of the resultant observations were... more far reaching... How much more effective and enjoyable teaching is when children are encouraged to express their ideas... and to feel accepted for their own opinions'.

The study helped teachers to identify a number of issues that have important implications for teaching, including:

- The importance of really listening to what pupils say even when the responses are unexpected.

- The range of development even in the small sample of children interviewed from each class. A significant outcome for many teachers was that children did not always perform according to expectation.
- Observing one child as a means of developing the skills needed for observing larger groups in a class.
- The importance of building in a planned way on the knowledge that children already have in order to ensure continuity and progression.
- The importance of discussion in learning, discussion both between pupils and between teacher and pupil.
- The choice of suitable activities, identified as meaningful activities, and the provision of firsthand experiences whenever possible.
- The need for flexibility to accommodate children's interests and develop their thinking.

The importance of these outcomes resides mainly in the way in which participation in the research process helped teachers to identify or to re-articulate the ideas for themselves.

For many of the teachers the research study became a starting point for further work on food as well as a strategy to adapt and use when introducing other science topics. The strategies were used in ways similar to the elicitation activities described in the SPACE (Science Processes and Concept Exploration) Project (Osborne *et al.* 1992).

One of the outcomes of the study was the recognition by teachers that the skills that were being demonstrated during the activities were not limited to the study of food-related topics but were applicable to the whole of science and health education. Of particular importance in the context of the study was the ability to classify objects and to observe similarities and differences.

The majority of teachers, including those working with infant classes, indicated that when they began the interviews they felt confident that pupils would have no difficulty in placing the pictures of foods into groups as a result of their earlier experience of grouping objects into sets. In many instances the activity revealed that even some 11-year-olds found the task difficult, not because they were confused by the cards themselves, or the number of cards involved, but because of their inability to transfer the skills they had gained elsewhere to this new situation. Younger pupils were more likely to find the task difficult. This finding suggested to teachers that children needed more experience of classifying objects in a variety of contexts with emphasis being placed on identifying similarities as well as differences. It was also noted that when food groupings were studied in more detail what appeared to be random groupings could be interpreted as a common sense view of foods that could be eaten together. This observation pointed to the need to provide children with opportunities to discuss and to explain what they were doing when sorting items.

Personal knowledge and understanding about food and nutrition

Many of the teachers, in describing the interviews with their pupils, indicated that they themselves had learnt more about food and diet as a result of undertaking the activity. Although their written reports rarely included details of what they had learnt about food, the group discussions (both prior to and after the interviews) led

to individuals raising questions about food that they wanted answered. The questions related to the knowledge implicit in the activities that were undertaken with pupils, namely food choice, nutrients and their function in the body, dietary patterns and health. Comments such as

> 'In doing the interviews I realised how much I didn't know about food!'
>
> 'I realised how limited my knowledge of food was, together with what we need and why.'

were common. Teachers recognised that the very nature of the activity had caused them to review their own ideas and understanding about aspects of food and diet. Some indicated that they now had greater awareness of what was meant by 'healthy eating' including linking excess or lack of nutrients to specific health disorders. Others commented on the level of children's awareness of health and diet in relation to their own: 'I also discovered that my own choices of food for meals would not, subject to similar analysis, produce very different comments from the children's'. This remark is significant. It reflects our common experience of eating food and can be linked to the constraints, including the social, economic and cultural factors, which influence food choices amongst both adults and children.

After completing the activities and writing about them many of the teachers still had questions they wanted to ask about food. Some related directly to the outcomes of the work undertaken with the children, for example: 'Do we need fat in the diet? How much do we need?' and 'Why do we need to eat salt?' Other questions related to issues which were currently being debated in the media. These questions were used as the starting point for further study and debate during the course.

Discussion

An important outcome of the study is the information gained about the understandings that children have about food and health, the ways in which children select and group foods, and their understandings about nutrients. The issue of food choice is an important one in the context of children's health. Surveys of the diets of young people have highlighted shifts in the patterns of food consumption (Department of Health 1989), including the move from family meals towards snacking and 'grazing'. This shift in itself is not necessarily cause for concern; however, the widespread consumption of snack foods high in fat and sugar is. The children in the study were aware of what constituted 'healthy' foods. Many of them recognised that what they termed 'unhealthy' foods were also ones that they enjoyed eating. Teachers have an important role to play in ensuring that children also appreciate that it is the amount of particular foods eaten that is important for health, rather than the exclusion of particular food items.

The classification systems used by children are of particular interest. The way in which many children grouped fruit and vegetables, meat and alternatives, and sweet foods is consistent with current advice concerning food selection that is being promoted by the Department of Health (1990). It is increasingly recognised that nutrient groupings are not readily understandable, even by adults.

The outcomes for teachers were also important, in particular the way in which they incorporated ideas developed during the study into their teaching of food-

based topics. However, the study had implications for schools as well as the course participants. The majority of teachers involved had responsibility for science in their schools and were thus in a position to act as agents of change. Innovative practice encouraged during their studies could lead to change which was not limited to their own classrooms, or to the schools in which they worked. Many teachers who participated in such courses were promoted to become head teachers or advisory teachers with local education authorities.

The extent to which teachers implemented new approaches later in the course was apparent from their reports on teaching and from the work undertaken by the children in their classes. For example, teachers altered their strategies to include finding out what the pupils already knew, providing opportunities to ask questions and encouraging children to take greater responsibility for their own learning. Pupils' ideas about food and health were challenged during group and class discussions. One class compared food choices made at the start of the topic with 'healthy menus' compiled after discussions about food choices. The most significant differences were the inclusion of wholemeal bread and more fruit and vegetables rather than the exclusion of all sweet foods and crisps. In concluding the topic, teachers on occasion encouraged reflective writing by asking pupils to write down what they now knew about food, thus providing opportunities for children to reflect, to identify further questions and to help teachers to judge learning outcomes.

It was evident from discussions and reports on teaching science that individuals were identifying and extending their understanding of the role of the reflective practitioner. One teacher wrote:

> Being a reflective practitioner has opened the door to so many considerations... the need for ample time... the importance of groupings of children and influencing factors, the importance of motivation and relevance... continuous on-going assessment, the importance of discussion... Just being aware of all these issues is a step in the right direction.

If teachers are to become reflective practitioners and to continue to develop professionally they need opportunity and time, as provided by extended INSET programmes.

An important element in current INSET for primary teachers is that of supporting teachers in assessment and monitoring the progress of pupils as part of the National Curriculum. The interviews proved an effective method of providing this support by enabling teachers to develop their professional competences in the ways elaborated above.

Conclusion

The findings from the research described in this article provide further evidence about the ideas that young people have about food and diet and have important implications for teaching. Additionally, the study demonstrated the benefits that teachers can derive from in-service programmes linked to research that encourage reflection on practice.

Long-term monitoring is required to gauge the success, or otherwise, of these methods. Such monitoring should consider pupils' progress in relation to their

understanding of food and health, including the factors governing food choices. It should also examine the extent to which the initiatives developed during the study become a part of the normal teaching strategies employed by teachers.

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