Aspects of environmental learning among 10-12 year-old schoolchildren

Mary Jocelyn Bagenal

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Abstract

This study is an investigation into some factors affecting children's environmental learning. Two chapters review previous work in the field of environmental cognition - in one the psychological processes involved in drawing sketch maps are considered, in the other a number of urban studies are summarised, with some accounts of methods and results for adults as well as children.

The fieldwork was carried out with two groups of top juniors aged 10-11 years old at a mixed school on a suburban estate at Ulverston, Cumbria, and with the intake of 11-12 year olds at the Lower Comprehensive School.

Some factors affecting behaviour were investigated and attempts made to relate these to the extent of the sketch maps drawn. It was suggested that behavioural differences control the opportunity for learning, and cognitive differences the extent and nature of learning. The extent of sketch maps was related to general school attainment, sex, and socio-economic group. Further influential factors were mode of transport, attendance at out of school organised activities and the junior school attended.

At the junior school there was some evidence for a distance decay function operating with respect to scale, with the home as origin. There was no substantial evidence to support the hypothesis of preference having a systematic effect on scale. A general ability to portray direction, both of a visually observed landmark, and of the location of home, through a built-environment, was demonstrated.

As well as sketch maps, free recall lists of road names were employed. It was concluded that the number of roads indicated on a map can be used as a measure of the extent of environmental knowledge with some validity (the correlation with numbers of roads on lists was $r = 0.68$) and some reliability (the correlation between successive years was $r = 0.61$).

Aspects of Environmental Learning Among 10-12 Year-old Schoolchildren

by

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Statement of Copyright

Preface

The fieldwork for this study was carried out in Ulverston, Cumbria, at Croftlands Junior School during July 1976 and June 1977 and at the Victoria High School, Lower School during July 1978.

The source for all the figures and tables of data included in this thesis was the fieldwork mentioned above which was carried out by the author. The street plan used in some figures was that issued by the South Lakeland District Council during the period of the study.

I am greatly indebted to Dr. D.C.D. Pocock who supervised this study and encouraged me throughout. Mr. C.D. Bishop of Cumbria County Council kindly gave permission for me to work in the schools and I would like to thank the Headmasters Mr. J. Davidson and Mr. R.H. Plane for making time available for the work. The staff at both the Victoria High School, Lower School and Croftlands Junior School were extremely helpful and kind to me. The children cooperated most willingly and it is their work which forms the material of this study, and I am most grateful to them. The staff of the South Lakeland District Council were very helpful. I appreciate the typographic facilities made available to me by the library staff at the Freshwater Biological Association's Windermere laboratory. Mrs Doreen Fishwick most ably typed this thesis. I owe a special debt to my husband Timothy Bagenal who encouraged me throughout the study. Finally I would like to thank Mr. F.J. Glen, Dr. G.H.J. Morgan and Dr. C.A. Brown who reintroduced me to academic work.

CHAPTER I

Introduction

This study is concerned with aspects of children's environmental learning in a small town, and with particular reference to the journey to school for the age group 10 - 12 years old. The focus is on the cognitive maps they hold of the area in which they live, and it is hoped that some of the influential factors in the formation of such maps may be identified.

In the model of environmental perception proposed by Pocock[1] he includes among his perceiver characteristics basic physiological make up, basic psychological make up, cultural characteristics and current state, all of which influence and are influenced by the image, which he portrays as leading to appraisive, designative and prescriptive modes of response. The environmental input is seen in terms of stored stimulus information, present stimulus information and present context. In applying this model to the sketch mapping situation, the output is the reflective recall of stored stimulus information which has itself been mediated by the characteristics of the perceiver. This model also shows that the prescriptive response, or behaviour, produces feedback both by changing the stored and current environmental stimulus information and by operation on perceiver characteristics. This study will therefore also investigate patterns of behaviour which might influence the formation of cognitive maps as well as considering cultural and psychological cognitive factors. Patterns of movement, which may be culturally determined, are here considered to be influenced by both social and physical attributes of the built environment. Although the author recognises the role of novelty and curiosity in exploration, this study

concentrates on regular patterns of movement. As Neisser[2] remarks 'The act of locomotion, which requires more information if it is to be carried out successfully, also produces more information for the moving perceiver.'

It is perhaps pertinent here to discuss the relation between schemata and the cognitive map. The author accepts Neisser's view of the perceptual schema as a dynamic plan for action with an anticipatory role, ready to pick up information as required. Different schemata are postulated, relating to different types of information. Such schemata will include relevant information from the larger cognitive map in which they are embedded,[3] pertinent to the instantaneous context; and they will also comprise, for example, spatial schemata about the relations between objects and their relations to the environment. The sketch map represents but a select sample at a particular time from the comprehensive attributes of the cognitive map.

Some understanding of the nature of cognitive maps is required because spatial behaviour is the outcome of cognitive mappings,[4] and movements of groups and migrations may be due as much to reflections of aspects of cognitive maps as of real ones. Because the individual's ability to survive depends on his adaptability and flexibility, and on his ability to consider alternatives now or in the future, so a wide cognitive map provides such alternatives, and increases man's control over his destiny. Another important function of the cognitive map is for the generation of frames of reference for understanding and interpreting our spatial environment. With the need for planning, it is important for children to understand their environments so they can take an informed role as future citizens. It may be difficult to understand large scale group phenomena as composites of small scale familial or

individual actions. Understanding how their own views of their town, coincide with and differ from those of others may be a first step in this educational process. Equally it is important for planners to understand the mental maps of towns held by different groups in the community.

This thesis is composed of eight chapters tracing the development of a line of thought from the general to the particular. Two review sections (Chapters II and III) set the background to the study: the first of these is concerned with psychological processes underlying environmental learning, and this is followed by an account of studies in urban environments, many of which are sketch mapping exercises, concluding with some studies of behaviour and the influence of neighbourhood. After a brief account of Ulverston, Cumbria, the town where the studies took place, the preliminary studies at a junior school are described. The main study at the comprehensive school (Chapter VI) follows and focuses on the relation between environmental information in two forms, as displayed by sketch maps and by lists of road names; some postulates linking these with behaviour are made, and the characteristics of the shared views of Ulverston held by children from different junior schools are described. In the next chapter there is illustrative material from individual children showing the wide range of individual differences. And in the final chapter both methods and findings are discussed and related to other studies.

The methods employed included questionnaires, 'out and about' diaries, sketch maps and lists of roads completed by the children. The latter, whose use elsewhere has not been noted by the author, provided a very useful independent measure of the extent of environmental

knowledge as well as contributing to an understanding of the organisation of information in different schemata. Throughout there was wide individual variability, both within and between individuals.

The results reveal the distinctive contribution of both some behavioural and cognitive factors in environmental learning. General school attainment was found to be important, though Moore[5] found no evidence for this in his review of the literature. Clear differences in environmental knowledge were found as between boys and girls. Incidental observations support the hypothesis of a distance decay function in relation to scale, and a definite, though variable, ability among these 10 year olds to represent a general direction on maps. There was also evidence for differential environmental knowledge based on the junior school attended. However, overall, the samples were small and the trends noted need further investigation.

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[2]Neisser, V. (1976) Cognition and Reality, San Francisco, W.H. Freeman & Co., p.114.

[3]Neisser (1976) p.112

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[5]Moore, G.T. (1979) 'Knowing about environmental knowing: the current state of theory and research on environmental cognition', Environment and Behaviour 11, 33-70.

CHAPTER II

Review - Psychological Processes in Environmental Learning

Learning about the environment involves a number of psychological processes, and though these may be distinguished on theoretical grounds the complex relationships between them are not easily demonstrated. Factors which have been recognised as influencing learning as a whole may well be operating in relation to one or more of the contributory processes. Much laboratory work has been carried out in attempts to isolate such factors and processes, and many basic principles have thus been demonstrated; but laboratory conditions are very different from those of the natural experience of everyday life. There have been studies with infants, with children and with adults as subjects and each has contributed to a greater understanding of underlying principles. In this review a wide range of work is included where it may have relevance for children's spatial learning.

Cognition, or knowing, is generally held to include perception as well as thinking, imagining, reasoning, judging and remembering.[1] However as perception is concerned with the direct operation of the senses in the presence of the stimulus object, it will be treated separately from the other aspects of cognition, which may be regarded as more strictly mental operations. It is also necessary to consider the subject of representation, for this is the means of demonstrating that learning has taken place.

PERCEPTION

Perception in the environment involves both perceiving objects and events and their arrangement in space. Though the observer may move, some objects and their positions will endure and once constituted perceptually as stable permanent things, will be perceived as such whatever the varying conditions under which they are viewed.[2]

For the normal child visual perception plays the major part in the identification of objects and their position in space; but other senses are brought into play as for example by the child who chooses to walk on the grass verge, or a low wall, in preference to the pavement, taking pleasure in sensorimotor activities.

Behaviour in everyday life is seldom a simple function of perception but is also affected by associated knowledge, experience and interests.[3] And although individual variations in perception occur, these must be minor, for it is essential to life that the environment should be perceived veridically: so that all share to some extent, a common view of the environment in which we live.[4] Gibson, who carried out experiments with young children and the 'visual cliff', maintains that perception of space and events in space, develops early and assists survival: while the perception of objects shows evolution and greater dependence on learning.[5] The correct identification of objects becomes easier when the child is able to name or use a word to label them. In the early stages of categorisation the child may employ superficial characteristics of appearance or similarity, but probably by 10-11 years, adequate grouping is effective where objects are classified according to their essential features.[6]

The effect of language on cognitive processes, according to the Whorf-Sapir hypothesis has three forms concerned with thinking, perception and memory. The strong form of the hypothesis attests that thought derives from language. The weak form attests that linguistic principles affect perception and may be employed to guide non-verbal behaviour, for example, the categorisation of objects by an individual may be constrained by the range of words available for shapes or colours

within his dialect or language. In the weakest form of the Whorf-Sapir hypothesis, language is believed to affect memory, in that objects more easily encoded in a language are more likely to be recalled or recognised than items whose encoding is difficult.[7]

Ellis and Muller showed that naming assisted the remembering of complex forms to a greater extent than the remembering of simple forms. It is likely that complex patterns, carrying more information than simple ones, require more inspection and greater arousal, for the reduction of uncertainty.[8]

Motivation may also affect perception; for in special cases of need or desire, perception may be facilitated and directed towards particular objects which satisfy those needs.[9] Beams showed that when children of 10-12 years old were asked to set pictures of liked, and disliked, foods at the distance at which they appeared the same size as the actual piece of food, the liked objects were set nearer than the disliked.[10]

Another illustration of the role of valuation in perceptual judgment was the result obtained when 10 year olds were asked to adjust the size of a disc of light to equal the size of coins and of cardboard discs. In general they were found to overestimate the size of coins by comparison with the size of the cardboard discs, and the more valuable the coin, the greater the degree of overestimation. Moreover children from poorer homes overestimated to a greater extent than those from well-to-do homes.[11]

In a more recent study the possibility of reward may also have influenced the judgement. Children waiting in a queue for Batman T-shirts were asked to estimate the number of children ahead of them; for T-shirts were only to be given to the first 25 children. Those

near the front were reasonably accurate in their estimates, whereas those at the back thought they were a lot nearer than they actually were.[12]

Personality factors are considered to affect perception. The studies by Witkin et al are the most wide ranging, and they described two modes of perception, or cognitive style, which they called field dependence and field independence.

The field dependent person, when carrying out the Rod and Frame Test, determines the vertical position of the rod in relation to the visual field surrounding it; and generally tips the rod too far towards the angle of tilt of the frame. The field independent person brings the rod close to the upright, perceiving it independently of the surrounding field and determining its orientation with reference to body position. These two modes of perceiving are associated with many other personality characteristics which distinguish the field-dependent from the field independent person. The field-dependent person finds it difficult to separate an item from its context, and has difficulty with some of the spatial subtests in intelligence tests, particularly those of block design, picture completion and object assembly, though they do well on tests associated with vocabulary, information and comprehension. Field-independent people are often able to separate an object from its context, can function with a fair degree of autonomy (though some are isolated individuals) and they have a general capacity for 'keeping things apart' in experience.[13]

Kalis evaluated people's view of the world through their perception of size and distance. She postualted that the field-dependent would view the world as large and close, while the over-differentiated, very field-independent person would view the world as distant, and the

objects small. Scores on a periscope tracing test correlated significantly with test scores on the Rod and Frame Test in the predicted direction.[14]

A developmental process going from field dependence to field independence, and also going towards increasing psychological differentiation, is postulated by Witkin et al. who believe that the relation between mother and child may well affect the cognitive style of the child. In their study they identified certain characteristics of the mother herself and of her child-rearing practices which they considered inhibited and others which fostered, the progress towards greater differentiation. In general maternal control which involved either coercion or at the other extreme, indulgence, inhibited such progress whereas a non-coercive but a directing attitude contributed to greater differentiation.

However Vernon regards the role of personality factors in perception with some caution and suggests that the field-dependent and field-independent continuum endeavours to incorporate too wide a range of perceptual characteristics and personality qualities within a single dichotomous classification.[15]

COGNITION AND COGNITIVE DEVELOPMENT

Cognition covers a whole range of mental processes which are organised into a system of cognitive structures that are both the result of invariant functions and environmental influences. Cognitive development is the development of a set of fundamental processes and not the acquisition of any specific piece of knowledge or information; it is neither just the result of the maturation of the individual, nor of the influence of the environment alone, but of the interaction of the two.[16]

How individuals make use of the perceptual information available to them depends on their cognitive skills or intelligence. These skills are evidenced in adaptive functioning in particular environmental settings. And intelligence tests only sample a limited range of skills, in order to make inferences about behaviour within that setting. Intelligence may be viewed as the products of perception and cognition.

In The Structure of Human Abilities Vernon postulates a hierarchical composition of specific skills in language, number, visualisation, manipulation and so forth.[17] Psychometric tests are based on this model with each subtest attempting to isolate a particular ability and the overall test providing a general measure of intelligence. Extensive application of these tests and versions modified for different age groups have resulted empirically in the establishment of developmental norms.

The development of intelligence in children has been studied from rather a different viewpoint by Jean Piaget and his colleagues, whose abstractions of the basic processes at work in the development of different concepts by the child has led to a general interactionist theory. For Piaget, intelligence is an adaptation.[18]

Several authors have described the course of the developing child's understanding of space which follows the sequence of action-in-space, perception-of-space and conceptions about space. As in other developmental sequences, the later stages incorporate and integrate the earlier stages, so that an individual as he reaches the higher stages, is still capable of, and will also continue to function at the lower levels. Indeed microgenesis (short-term learning in a new situation) is believed to follow a similar pattern to ontogenesis (individual development over the life span).

Development also incorporates a transition from the global view, where the self is not separated from the environment; to the highly differentiated view with its greater organisation and articulation. Thus the more highly developed individual is capable of greater flexibility of behaviour and understanding while also achieving a greater stability.

Piaget describes a mode of intellectual functioning which consists of assimilation (the incorporation of the world into existing schemata) and accommodation (the readjustment of such schemata to the external world) which together result in equilibration and the transition from one stage to the next. He has identified four major periods: those of sensorimotor, preoperational, concrete operational and formal operational space.

The contents of spatial cognition are identified as three classes of spatial relations: topological, projective and euclidian or metric relations. The sensorimotor period is pre-representational. Representational cognition occurs in the preoperational period with the grasping of the topological relations of proximity, closure and so on, which remain invariant under deformations. Projective relations comprise those properties which remain invariant when viewed from a different point, or when projected; these also are grasped in the intuitive and preoperational period, but later than the topological relations. The formation of the final stage in the child's conception of spatial relations involves euclidean or metric space. These properties are relations whose equivalence depends on mathematical-geometrical equality.[19] It should be noted however that Piaget and Inhelder draw the distinction between spatial perception and spatial imagery or representation, which takes place within conceptual space;

and they maintain that spatial perception may even reach a projective or quasi-metric level at an age when spatial imagery has barely begun.[20] Children can solve a problem in a concrete situation before they can solve it from memory.[21]

Most of Piaget's theory derives from experiments in the laboratory or class room, so that the spatial relations may be comprehended within the span of the visual field. Experience of the large-scale environment takes place in transperceptual space, and as Downs and Stea remark, because the two scales are quite distinct, the conclusions obtained from the study of one spatial scale neither necessarily contradict nor support those obtained from the study of another scale.[22]

Within the large scale environment the child first orientates himself to the physical world using axes or planes defined with respect to his own body, this has been called the period of egocentric orientation. Later he learns to used fixed systems of reference, in which the most frequent and important reference point is the home; this is called domicentric orientation. Later the individual is assumed to have achieved a coordinated system of reference.[23] Piaget holds that such a system is based on a grid; but Lee, intuitively, favours a polar system.[24] Finally, a culturally determined system, related to the cardinal directions may be adopted, and any such abstract system must be related to observable features or properties of the environment.

CULTURAL INFLUENCES AND COGNITION

In any discussion of cognitive processes the question of cultural influences arises, for differences observed between individuals may have origins in cultural variables. The role of language has already been mentioned. Cross-cultural studies exist in relation to both

spatial ability on the structural model and to the development of Piagetian intelligence and the manipulation of spatial concepts.[25] These studies suggest that basic topological properties are least influenced by cultural variables.[26]

The question of sex differences in cognitive processes may be viewed as either a biological phenomenon or as subcultural differences due to the stereotyping of sex roles.

Witkin et al[27] found sex differences in performance on a number of tasks and concluded there were pervasive sex differences in mode of field approach. Woman as a group tend toward a global field approach in their perceptual and intellectual functioning, men toward an analytical approach.

Several authors[28] report sex differences in performance of certain spatial tasks in psychometric tests. Taylor found marked sex differences on a battery of spatial and other tests, also with superiority of boys on spatial, and girls on verbal reasoning tests; but he found no significant sex differences in test performance in any of the Geography tests. However in the Memory for Designs test he found greater accuracy of detail amongst the girls and more correct proportions amongst the boys.[29]

Sherman concludes that experience plays a large part in male-female differences in spatial perception and notes that boys spend time in aiming activities, games and model building while girls are dependent, spend more time with mother, explore less and develop increased verbal skills.[30]

It has been suggested that child rearing practices make girls more 'field-dependent' and 'visual' in their perceptual habits, and more emotionally dependent in their social and psychological relationships.[31]

The role of social class may also be considered as a subcultural variable which may affect learning. The avenues for exploration for children of low socio-economic status may be limited by lack of a stimulating home environment and less well developed habits of hearing, seeing and thinking. As the youth of poverty is reinforced for chanelling his attention and energy toward mechanical abilities and other non-verbal tasks, so he becomes less responsive to those in his home and school environment which would require the development of verbal and symbolic activities, and he remains slower and less competent in the transition from concrete to abstract modes of thinking.[32]

MEMORY

The individual moving through the large scale environment generally builds up some sort of reference system in memory; if his experience is to be useful to him, then successive images must be linked together with previous learning. It is impossible to experience the whole of a built environment at one time, and, necessarily, learning, when it takes place, takes place over a number of separate journeys. There are those people, however, who when asked, are unable to give directions and seem not to carry a map in their mind, but who presumably rely on the successive recognition of decision points in the course of a journey.

Bartlett distinguished between unthinking "rote recapitulation" and the constructive nature of remembering.[33] Such rote recapitualtion may be the mechanism at work where a succession of movements is learned by blindfold students following a maze.[34]

In the larger environment the abstracted reference systems consist of schemata in whose formation processes of blending, condensation, omission and invention play a part and images may be viewed as the

mechanism by which objects and situations may be organised into schemata by surmounting the chronology of presentations. Remembering involves a great deal of organisation both of psychological material, and of attitudes and interests, so that more bridges are built from one sensory mode to another, and from one interest to another.[35]

Some Russian psychologists believe that the ability to speak allows conscious planning to be possible; thus the young child instructs himself in words to carry out actions.[36] Lee remarks that in predicting a persons likelihood of embarking on a journey his schema provides better data than any measure of the real environment.[37] But neither Piaget nor the Russian investigators assume that image-driven behaviour and schemata consist of visual representations alone or even primarily. They stress the individual's action schema in relation to the object as an important basis of mental representation or schematisation.[38]

Bartlett found in his early experiments that the assignment of names, to objects observed, often strongly influenced their immediate reproduction or description. He noted too that when names had been assigned to objects, they might be used to count the objects during recall and frequently helped to maintain the correct order, but allowed very considerable variations of form to occur in the representation of the objects.[39]

On the subject of imagery in childrens learning Paivio observed "imagery is specialised for the processing of spatial information, whereas the verbal system is characterised more by its capacity for sequential processing". He noted that the developmental changes occurring at around 7 to 8 years of age correspond to the beginning of

anticipatory imagery and of symbolic modes of thought, and this may be the age at which symbolic transformations from words to images and back again takes a quantum leap.[40] It is interesting that even in four year olds the multirepresentational nature of memory was demonstrated when working with visual and verbal material.[41]

In discussion Rohwer concluded that imagery is most effective when a verbal tag is stored with the image.[42]

There is some disagreement about the interpretation to be placed on the observation of a developmental trend towards increasing use of imagery with increasing age. Reese attributed the trend to the tendency of the young child to store imagery as separate elements and a failure to observe the associations depicted.[43] Rohwer suggests the trend is due to a failure of the young child to store suitable verbalisations with the image, but remarks that these trends were observed in middle class white children but that the trends are reversed for lower class black children.[44]

In the context of environmental learning, road names are usually written up and so appear with the road; but many road names will have been learnt by the child in conversation, or when following directions or in reference to the homes of friends or relations. In newer parts of towns road names are placed only a few feet above the ground and may be easily read by children; but in older parts they are often high up or even missing. The name of a neighbourhood, though in general use, may not appear on signs within the district, but only as destinations on buses. So that, although some environmental information is presented, ready labelled, so to speak, much depends on the proper association of name and location.

It should be noted that there is a real distinction between recognition and recall, and that these are non-equivalent aspects of memory. Recognition can only take place in the presence of a stimulus, and this may often be in the same mode as the original presentation.[45] The essence of recall is that the item must be retrieved from memory, and it may or may not be in the same mode as the original presentation. Many of us, in conversation, find it difficult to recall the name of the person to whom we wish to refer. Verbal tags are often not presented with the object, but learnt later.

In recall both discrimination and retrieval processes are employed. First the object or event is retrieved and then discrimination is exercised as to whether it belongs to the set of items required. In recognition it is the discriminative attributes which are primarily responsible. This suggests why recognition, even of words in a list for example, tends to be better than recall, since a word which is capable of recognition will fail to be recalled if it is not first retrieved from memory. Words that occur with high frequency are easier to recall than words occurring with low frequency, if we assume that common words are more easily retrieved than uncommon ones. But words of high frequency are harder to recognise than words of low frequency, for, if recognition is based on familiarity, the additional occurence of a high frequency word would have only a marginal effect on that word's already high familiarity.[46] This generation-discrimination theory, though developed in relation to directed learning in the laboratory, may have application to objects and locations encountered with high or low frequency in the environment. When recalling a place it is probably the most familiar aspects which spring to mind; but in

moving through a familiar environment it may be the less familiar aspects to which attention is directed, and which are recognised.

To summarise, it is appropriate to quote Vernon "to adapt appropriately to the environment the child .... must acquire some understanding of the nature of objects in the environment ... Acquisition is therefore dependent on the cognitive processes of learning and memory, supplemented increasingly by reasoning about the physical environment and the forces which operate on it."[47]

REPRESENTATION

There are different modes of representation which may be functionally similar but formally different. Environmental knowledge may be displayed in the form of a drawing or map, or, for example, as a list of street names or a description.[48]

A map is a particular kind of conventional representation of spatial relations and differs markedly from photographs or drawings in which linear perspective, light and shade, relative size and interposition give clues to depth.

If such spatial relationships are to be represented by a two-dimensional map, then three operations have to be employed. Firstly the viewpoint has to be altered to the vertical or birds eye view, secondly minaturisation must take place, and thirdly a symbolic transformation must be conducted, where roads are represented by lines and other conventional symbols are employed.

In the Richmond Tests[49] currently employed in schools, the map-reading problems set for younger children (7-8 years old) are by reference to oblique aerial perspective drawings. Those for 10-11 year olds are of two forms, one with vertical perspective, symbolic

notation and a legend and the other , a part of a town, has double lines for roads, and buildings are shown in oblique perspective. From 11-12 years on, all the maps adopt the vertical perspective and symbolic representation with a legend, though they tend to be of large areas, with a very small scale and not much detail. These must be considered developmental norms.

A sketch map is a particular kind of drawing and Eng reports that children are able to understand drawings before they make them; that the receptive side of an activity is developed earlier than the productive side. She also notes that "children draw what they know: not what they see" and this may be allied to the fact that children draw in an abstract and formalised manner and not in a naturalistic one.[50]

When children draw pictures of their home area, locations and buildings are drawn to a scale reflecting their relative importance. Thus their own homes are by far the largest objects, with either their school or their friend's houses next in size.[51]

In the development of children's drawings a regressive stage at 11-14 years has been noted. During this stage the drawings show a deterioration or regression. Progress becomes laborious and slow there is increased self criticism, increased power of observation, and increased capacity for aesthetic appreciation. The growing ability to self-expression through language also plays a part.[52] Harris quotes Bell who postulates that "features most recently acquired are most readily disrupted by dramatic upset in the environment or field forces. Such upset leads to distortion of drawing phenomena in a given stage, or to regression to an earlier stage".[53] The change from junior to secondary school may act as just such an upset in the environment.

Sketch maps have been in widespread use for the investigation of environmental knowing. In the following chapter some applications to and aspects of this technique in studies in the urban environment will be considered.

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CHAPTER III

Review - Urban Studies and Environmental Learning

This chapter focuses on studies of cognitive mapping in the urban environment. From the psychological studies discussed in the last chapter it is evident that cognitive mapping is a complex interactive, selective and organising process.[1]

In order to use a town or city, the physical lay out must be learned, the functions of different neighbourhoods and buildings need to be understood and some idea of distance is required.

All these aspects become integrated into the overall mental image of the city; and it is on the basis of this image that patterns of behaviour develop, for, as Lee remarks "In predicting a persons likelihood of embarking on a journey, his schema provides better data than any measures of the real environment".[2]

To conclude the chapter there is some discussion of studies affecting children's behaviour and the journey to school.

SPATIAL FRAMEWORK

For a child it is necessary first to establish and learn the perceptual constancies of the environment. Buildings and pathways do not move, distances remain the same whether they are up or down hill, though they may not seem so. The appearance of a skyline changes due to motion parallax as the observer moves; the same object appears different from different angles. Durham cathedral appeared like the QE2 from one aspect and like Appollo 13 from another.[3] But once a building has been identified and located, it becomes established as a perceptual constant, and, aided perhaps by its name, uncertainty is reduced.

The essential problem in learning about the spatial relationships of the larger built environment is that they cannot be apprehended at one time; and information from many journeys has to be assimilated to existing cognitive structures. But since sketch maps do display spatial relationships, these have been widely used in efforts to reveal individuals spatial knowledge.

Appleyard devised a typology of sketch maps, which was essentially ways of describing different networks. There were four types of increasing complexity based on a sequential form, and four more, again of increasing complexity, based on a spatial form.[4] These types have been used as a basis for comparisons of perceptions of a town held by different groups of residents within it;[5] and, in a modified form for the comparison of perceptions of Durham by residents, visitors and tourists.[6] In the latter study, by Pocock, there was a steady increase in the proportion of spatial-style maps from the residents, to the visitors, to the tourists. The explanation for this is probably that tourists recall the imageable parts of a city but do not always manage to connect these together. These map types were also analysed in relation to factors such as age, sex, familiarity with the city, and social class. Males in all groups were observed to draw more sophisticated maps than females. Consideration of the overall orientation of the maps supports the hypothesis that the line of entry into the city is reflected in the orientation of the image i.e. that the orientation is a direct result of the experience of different individuals.

In another study, Canter[7] expressed the complexity of form quantitatively, by considering the number of 'links' and of 'locations' on a map. He speculated that a strongly experience-orientated viewpoint would predict a predominance of links over locations, and a view

which stressed the organising ability of the individual would predict a predominance of locations. In fact, he found, when analysing a series of maps drawn by a visitor to London, after set intervals of time, that there was a steady increase in both scores. However such a quantitative measure does not distinguish between the extent of a map and its complexity. A simple map covering a larger area may score the same as a more complex map covering a smaller area.

Lynch,[8] who elicited images of the centres of three cities in America by a variety of techniques, points out that different cities have greater or less 'legibility'. The city used by Appleyard to develop his typology was Cuided Guyana, which is composed of a series of settlements along a main artery; Pocock had to modify the categories for use with sketch maps of Durham; the modification was also preferred for a cognitive mapping exercise by Murray and Spencer in Sheffield.[9]

In a study in Holland it was demonstrated that some cities had a clearer image than others; Amsterdam was clearer than Rotterdam. Within Delft, two residential neighbourhoods were compared, and even local residents got lost in the modern uniform one, but not in the older neighbourhood. In one difficult area in the Hague, the inhabitants found their way because they knew each path separately, but not because they comprehended the overall pattern.[10]

EVALUATIVE ATTRIBUTES

It has been noted that the mental image is the result of a selective process, and the inclusion of certain items on a sketch map denotes some sort of interest or preference in their selection. For example, in a study of Harwich it was noted that childred had marked

sweet shops and allotments.[11] And in a study in Birmingham, confirmation of preferences for parks and play areas marked on children's maps, was found in the essays they wrote.[12]

Items of interest or preference may produce particular responses. Miller, Galanter and Pribram discuss Lewin's concept of valence, based on an intention towards a particular object or place; and view this as the uncompleted parts of a plan. So that, before posting a letter, a letter box has a positive valence, but thereafter all letter boxes are ignored.[13]

A journey then may always need to be considered in relation to its goal. The expression 'subjective distance' was coined when it was found that estimates of distance to department stores and discount houses were affected by their character. This was confirmed by consideration of distance estimates by those who shopped in a store and presumably viewed it positively; in contrast, those who did not shop there estimated that the store was further away.[14]

On a purely psychological and world scale it was found that estimates of distance by students from Stockholm to cities in other parts of the world were related to their imagined emotional involvement in the chosen cities.[15] However, Canter and Tagg regard this as two different measures of the same concept, involvement in the goal.[16]

Gould, in a study in Jönköpping, Sweden, asked children to list the places they would like to live; he also asked them to list the names of places they knew, and so he was able to draw preference and information surfaces for the different age groups. The information surfaces he related to the population of the towns and their distance from Jönköpping: and he found that in general the preference surfaces

correlated with the information surfaces; but this did not explain the reasons for preference. He concludes that such information surfaces form rapidly between the ages of 7-11 years, but from 13 years onwards the learning curves begin to tail off.[17]

Another type of preference study used a semantic differential technique to elicit actual and ideal views of Small Heath, Birmingham, by junior and by senior school children. In general this showed an overall satisfaction with the human aspects and dissatisfaction with the physical aspects, from the juniors, and a more negative response from the seniors. This may have been due to the seniors' broader knowledge of the city for comparison.[18] This study poses the question, whether the social environment is more important than the physical environment to children. And to what extent children's views of the ideal are influenced by adult values. But, as Jane Jacobs points out, sidewalks are often more interesting play areas than parks though planners may not see it this way.[19]

SOCIAL PERCEPTION AND BEHAVIOUR

It is impossible to separate places from their social attributes, for every activity takes place somewhere. Subjective social space has been defined as that space perceived by members of particular social groups and is related to the physical space within which groups live, work, move and interact. At the town scale Buttimer has discussed the study of social space on three levels, the behavioural level (where people live and move), the level of knowledge (where people know that alternative opportunities are available) and the aspirational level (where people would like to go if they had the opportunity).[20]

Lee investigated the idea of neighbourhood held by housewives. In a series of interviews he asked them to define the area on an ordnance survey map. Although there were considerable individual differences, it was found that average areas for a neighbourhood throughout Cambridge, were much the same at about 100 acres. From his study of local social involvement he found that the more spatially extensive maps were associated with larger numbers of friends, and of clubs and organisations to which the respondent belonged; there was also a tendency to use local shops rather than town centre or non-local ones. The internal representation of such a neighbourhood he called the socio-spatial schema.[21]

Since perceived social space is related to the action space of the individual, Pocock studied the movement patterns of a jute mill worker and an electronics executive over a period of a month in Dundee. For both of these, places on the route from home to work scored highly, as did areas around the home. Not only did the executive make many more journeys but he travelled over a much greater area of the city; and the areas visited by the two men showed little overlap apart from the city centre.[22]

Such variations in movement and social involvement may underlie the differing composite sketch maps of Los Angeles, produced by five different ethnic and social groups living in the city.[23] Restricted maps were produced by the predominantly Spanish speaking residents of Boyle Heights; less constricted was the map of the negro sample at Avalon; the Fairfax sample map drawn by residents in an older predominantly Jewish middle class area included the San Fernando valley, an area of heavy second generation Jewish settlement. And the most well

formed and detailed maps of the entire area of Los Angeles came from the upper class residents of Westwood.

There is evidence for differences in perceived home area as between husbands and wives amongst middle class couples from the Mar Vista area of Los Angeles, due presumably to their different roles.[24] Spatial behaviour is the outcome of choices, and the limits of free choice are generally wider for the more wealthy and spatially mobile; and narrower for the poor, the old, those with young children, those without a car and so on.

Pocock mentions the concept of social space where sizes increase and distances shrink between areas of similar socio-economic characteristics to the individuals home area, and the reverse happens for areas of inferior or functionally unrelated characteristics. Thus there may be an increase in the perceived distance between adjacent shopping and office zones of a city centre, but a reduction from an individual's neighbourhood to a similar or more preferred one.[25] A survey in Highgate 'village' in London, for example, revealed an extension of the (desirable) village towards the perceivers residence.[26]

The above findings, however, relate to the adult conception of the environment. Differences might be expected if the focus is turned to the world of the child. In an exercise where black adolescent boys were asked to draw a map of their neighbourhood in Boston, great variability was found in types of drawing, and in the extent of the neighbourhood depicted. The drawings varied from pictorial and schematic to maps with identifiable objects, as well as varying in the scale and amount of information included. There was no clear relationship between neighbourhood size and the distance between the subjects residence and school, nor between neighbourhood size and the length of

time in residence. The great individual variability was illustrated by the very different maps of two brothers, and from boys living in the same street.[27]

In another study[28] children of different ages and different ethnic origins from Houston, Texas, drew maps which showed considerable variation in the areas depicted as the home neighbourhood. Elementary school children conceived of their home area as being smaller than secondary school children. The Anglo-American children conceived of a larger home area than did the Mexican-American and the black children. Marked differences occurred in the proximity of friends in the different groups, for black and Mexican-American children had playmates living closer, often in the same block, while Anglo-American children had friends living one block or more from their homes. No consistent differences between sexes were noted and all the children came from a poor village area.

Differences in the home area between black girls and boys was found in a study in Baltimore with boys having a larger home area as measured by total path length of an area delineated on an aerial photograph. The fourth grade boys had a wider home area than the second grade boys as expected, but differences between home areas of children from the inner city and suburban area were less than had been expected, as these had been chosen for environmental contrast. It was noted that more suburban children had bicycles, and that more suburban homes had gardens, and there was likely to be differential control by parents, all of which would have contributed to the observed pattern.[29] These same factors are also likely to influence behavioural patterns of children in British towns and cities.

DISTANCE

When sketch maps exhibit a particular property and this is associated with a behavioural factor, it may be assumed that this represents the cognitive structuring of experience. However there may be tendencies to make stereotype drawings based on a more generalised experience of city form. To attempt to reveal which attributes may be the properties of the cognitive system, and which have been imposed in drawing, it is desirable to 'tap' aspects of the cognitive system in other ways. For this purpose distance estimates are especially useful, for these are properties of spatial relations which necessarily form part of an individual's cognitive map.

The decision to undertake a journey more often depends on the overall distance to be travelled than on the details of the route. Distances may be thought of in various ways: as time taken, as cost or effort expended on the journey, as the route covered or as a locational relationship.

Although several urban studies have revealed a general tendency to overestimation,[30] distance estimates have shown a high correlation with actual distances. Time estimates have been more variable,[31] and were not considered worth collecting in one study.[32]

Investigations of the relationship between estimated and actual distances in a number of cities, by Canter and Tagg, showed that topographical features, which determine the conformation or legibility of the city, are reflected in the estimates. For example in Glasgow the estimated locations of places by respondents, tended to be distorted towards the Clyde; and estimated distances seem to have been affected by the positions of bridges across the river. In Tokyo the elliptical

route of the railway system seems to have been cognitively transformed to a circle in the memory, and in that way to have influenced distance estimates. Overestimation of distances up to six miles, and underestimation of longer distances occurred in London, Glasgow and Heidelburg, all of which are divided by rivers; whereas there was a tendency for all distances to be overestimated in Nagoya, Sydney, Edinburgh and Tokyo, cities bounded by bays or oceans.

All these were 'crowflight' estimates, which Canter considers must be derived from some generalised internal representation of the city and not directly from the memory of a journey.[33]

Many of the studies mentioned employed students as respondents and they may have used the topographical features as conceptual links in developing an overall view of the city. Lower correlations between actual and estimated distances found in one study were attributed to the fact that residents had been used as respondents,[34] for these a more subjective, evaluative process might be expected, associated with emotional involvements with particular features of their own city, and thus might show greater individual differences than the more objective approach of the students in the other studies, many of whom had appropriate specialised training.

Brennan observed that women shoppers in Wolverhampton used the shops towards the city centre even when the outward shops were closer at hand, thus violating the principle of minimising effort.[35] Lee in Cambridge[36] and Potter in Stockport[37] confirmed these findings. It has been suggested that this is a result of a positive valence or attraction towards the centre; and there is also a tendency for lower prices, in the city centre.[38]

Both Lee[39] and Briggs[40] have compared distance estimates into and out from city centres. They employed different methods, in different cities and came to conflicting conclusions. In Lee's study the distances outward were overestimated to a significantly greater extent than those inward, at the walking scale. Briggs found a tendency for overestimation of driving distances toward the city centre. Lee's explanation was based on the attractiveness of the city centre, Briggs on a learning model of the experience of traffic congestion near the city centre. But different patterns of distance estimation are observed as between the older and more modern cities, and the differences between the two cities Dundee and Columbus, may partly account for the discrepency.[41]

In both studies the hypothesis was posed that journeys with more corners would seem longer than those with fewer. For Piaget, at the microscale, had shown that children judge lines with bends as longer than straight ones of equal length. But Briggs test of this hypothesis was rejected, though in effect he adopts special pleading when he remarks that this is due to the grid pattern of the street network.

A study of women consumers in Germany showed that the lengths of central shopping streets were regularly underestimated when in the direction of the respondent's home and familiarity was identified as a contributing factor.[42]

So far the emphases have been on the role of distance studies in revealing aspects of cognitive functioning in the formation of internal representations of the urban scene. A brief account of the methods used is also appropriate, since different methods of eliciting distance estimates make different demands on cognitive abilities, and may affect the results obtained.

Canter and Tagg in their studies of major world cities asked their respondents for direct estimates of crowflight distances to the nearest half kilometre or half mile.[43] In the German study of shopping streets, the direct length in metres was asked for, for distances of 430 m, 450 m and 500 m.[44]

Methods involving a very considerable mental reduction in scale were employed by Lee, who used a horizontal scale about 6 inches in length on which estimates were marked.[45] Briggs also used a scale, this time of 50 cm (approximately 20 inches) marked off in kilometre intervals; as well as asking for judgements in relation to a marked standard length which represented the distance between two fixed locations in the city.[46] In an attempt to overcome the problem of differential familiarity, Lowrey used two ratio scaling techniques based on the distances of familiar urban facilities such as bus stops, library, post office etc which were known to the respondents. One method involved paired and one multiple comparisons, all expressed as lengths of lines on a card.[47]

From the German study it was found that frequently visited shopping streets are cognised as too short[48] and this conflicts with results from other studies. But in the shopping context a street may be chosen for the variety and interest it provides and this may affect the apparent length of the street.

In order to compare different methods of distance estimation and investigate their applicability, Day compared four methods at a variety of urban scales. He elicited sketch maps, asked for direct verbal estimates in miles, for mile estimates on a graduated scale and he used a ratio scaling technique. These were carried out in Australia, in

the Sydney suburbs of Killara and Bexley, and also in Armidale. The distances varied from about 300 - 2000 yards in the central area of Sydney, from about 1,300 - 7,500 yards in Armidale and from 3.1 to 22.5 miles in the Sydney metropolitan area studies. In all cases there was a very high linear correlation between actual and mean estimated distances; though the regression lines show some variation this was not significant statistically when sample mean values were used. Individual differences were very large and did not operate in a systematic way. The results were conflicting: in the Bexley sample there was a tendency to overestimate distances below 1,200 yards and underestimate those over that figure; and in Armidale some of the shorter distances below 4,000 yards were underestimated, though overestimation was fairly general. He concluded that familiarity may be a factor affecting estimation, but that under 500 yards, rounding off of estimates to a quarter or half a mile produced overestimation.[49]

The Australian study appears to support the hypothesis that, amongst these four, the actual method of eliciting cognitive distance estimates does not in general have a systematic effect on such estimates and that differences due to different techniques are not significant statistically because of the very large individual variations.

In London it was found that the ability to produce a sketch map does correlate significantly with the ability to estimate distances.[50] It was also concluded, by comparing distance estimates before and after a mapping exercise, that a more complete cognitive representation leads to large estimates.

Characteristics of the respondents which might affect distance estimates were noted by Lowrey, who found significant differences in

estimating distances between drivers and non drivers, the latter were found to be less variable in their estimates.[51] In the German study no clear relationships with length of education, age or social class were found among the distance estimates of these women shoppers.[52]

As far as familiarity is concerned, there is considerable fragmentation of urban knowledge in the early stages of coming to know a city, and one would expect wide variability in distance estimates, improving in accuracy with greater familiarity. In the retailing context preference is difficult to separate from familiarity, for we patronise those shops we prefer and visit those we dislike less frequently. In Lowrey's study facilities seen as desirable such as library, post office and park were cognised as relatively closer to home than those seen as less desirable such as motorway interchanges.[53]

The importance of the home area occurs in several contexts: the relative size devoted to it on children's maps,[54] the effect on the orientation of a map,[55] and on distance estimates.[56] Developmentally children pass through a stage of domicentric orientation, and in getting to know a new town or city, the home is one of the first reference points. The home must generally be the place of greatest familiarity and preference.

Although Pocock[57] suggests topological deformation of the individuals representation of his action space as he moves through the city, such a schema for a plan of action with goal involvement, may be separate from the memory store of fixed references in the environment. It is possible that some of these studies were in fact tapping the former internal representation rather than the latter, in individual cases, and this may account for some of the wide variability in results. The

amalgamation and analysis of results from whole samples evens out these differences so that some clear relationships are demonstrated.

The general correlation between cognised distance and actual distance allows the examination of distortions, and these throw light on some of the factors influencing internal representations.

REPRESENTATION

While some features of sketch maps clearly reflect cognitive structuring of information, there are other features which may be a consequence of the representational process or the drawing ability of the subject.

In a series of exercises with Geography students it was noted that there was a tendency to make angles into right angles,[58] and towards symmetry,[59] also, roads tended to be drawn in the directions of the major compass points. Since mapping ability should have been well developed in these students, it appears such simplifications were cognitively imposed.

In a small town it was found that middle class respondents had a greater sense of spatial structure than the working class, and drew more extensive maps. Since the whole town was within walking distances it seems likely that the activity patterns would largely overlap and in fact the two public houses that appeared on the middle class maps did not have a middle class clientele.[60]

Lower class and older people tend to refuse to take part in mapping exercises.[61] How much these refusals are due to lack of interest, or to poor articulation of the spatial structure, or to lack of representational ability, is not clear; all could play a part.

Moore, in a discussion on the growth of environmental knowing, distinguished between the developing ability of the child to conceptualise the larger environment in terms of Piagetian stages, and of an individual's development from unfamiliarity to familiarity with a particular area. However, he concludes that the latter passes through very similar stages. Appleyard considered his map types as different styles of representation, but Moore fits his firmly into a developmental framework, at three levels 1) undifferentiated egocentric 2) differentiated and partially co-ordinated into fixed subgroups and 3) abstractly coordinated and hierarchically integrated. At the lower levels topological relations hold but at the third level the elements within the map are interrelated with approximate projective and euclidean accuracy. He hypothesised that an individual would represent subjectively familiar areas of the city in a more organised manner than the less familiar, which would be represented in a partially coordinated way, and that such an individual would be able to carry out associativity and reversibility tasks in the familiar area more often than in the less familiar. The results showed that level of representation and performance on tasks were both related to the degree of familiarity with different parts of the environment, for the same individual.[62]

One study was concerned with the types and degrees of distortion of sketch maps drawn by teenagers coming to know a city, London, new to them, over a period of a month. Oscillations in distortions were interpreted in transactional constructivist terms as equilibrations to one developmental level, based on partially coordinated but separated regions organised around fixed references; and then to higher levels of organisation where distortions subsided as they learned more about the city.[63]

A quantitative study of the growth of enviromental knowledge was made with the wives of U.S. Navy personnel, newly arrived in a small town, Idaho Falls. Maps drawn about $2\frac{1}{2}$ weeks after arrival were dominated by streets, on average there were 20.3 per map, and the home street was generally clearly labelled. Follow-up maps drawn after three months had about double the number of streets and the home area was relatively less important as other features had become incorporated. This town had quite large areas on a grid system, many streets were named, but some were numbered and some denoted by letters of the alphabet[64] which probably made it easier to remember than the more meandering and less systematically named streets of a British town.

Further evidence on the representational process was obtained from a study of the order in which sketch maps were drawn, and the stages they passed through. This was done by taking four groups of people in London, asking them to draw maps, and then stopping one group after one minute, another after three minutes, another after five minutes, and the last after seven minutes. The similarity of representation in each of the four time periods, to the series in Appleyards categories was apparent, suggesting that the individual styles of representation identified by him are analagous to stages in the continuing development of drawing a map.[65]

Highly significant ethnic differences in childrens maps occurred in the percentage of the map devoted to the home. For black children the home occupied on average 25.1% of the map, for Mexican-American children 5.1% and for Anglo-American children 2.5% of the map. When asked to draw a map of the city of Houston again highly significant ethnic differences occurred, 84% of the Anglo-American children attempted

the task, one black child and no Mexican-American children. The Anglo-American children apparently possess a life style and imagery of their environment which is highly complex in comparison with the black children, with both greater mobility and more stimulation.[66] In one study a hypothesis of a distance decay function in relation to scale, detail and density of elements is postulated.[67]

Analysis of the features included on sketch maps by the whole age range of school children in Small Heath, Birmingham showed an interesting trend from the unique to the shared view. From the 9 and 10 year olds there were large numbers of features of individual personal interest with only a few mentions, and at the other extreme only a few common features mentioned by many children. In contrast the items from the seniors' maps have a more general distribution with from five to twenty mentions for a large number of places. Because the Eastern and Western sections had rather different characters a comparison was made of the average numbers of features depicted in each zone by junior and senior school children. The Eastern zone had been designated a general improvement area and the majority of buildings have remained intact; whereas the Western zone is due for renewal and has fewer buildings and more open spaces due to demolition. For both juniors and seniors the Eastern section scored more highly, which again supports the view that the physical environment determines its memorable qualities, which tend to have a general appeal.

The types of landmarks noted by children differ from those of the adults in Lynch's study, and include roadside items and street furniture. In the Small Heath study the seniors included larger buildings such as churches and public houses as well as shops and parks.[68]

Uzzell has suggested that fewer landmarks on a map might imply more abstract thinking,[69] but it could be a reflection of the desire to produce something more like a conventional map, or to a tendency to try to get around with the minimum of cues.

THE CHILD AND THE NEIGHBOURHOOD

Lynch[70] listed neighbourhoods as one of the basic elements contributing to the image of the city, and Lee[71] investigated some social concomitants of neighbourhood area. Robson[72] set out to define neighbourhoods on a number of demographic dimensions, and to test the validity of neighbourhood as a territorial group of people with a common mode of living, striving for common objectives, he investigated educational aspirations for secondary schooling. A significant correlation between educational aspiration and the social class of parents was found[73] but it was shown that people of similar social class display very different attitudes to education, depending on the area in which they live.[74]

Another study revealing the influence of neighbourhood was that of membership of formal associations and clubs. In this case neighbourhood was more important in determining social behaviour than the personal characteristics of the individual.[75] Two explanations were offered, first, that the neighbourhood characteristics may be an index to the self image of the individual and second that the neighbourhood itself might be a factor in the kinds of pressures which are brought to bear on the individual to participate in formal associations.

However, in the educational field it is the individual who is exposed to pressures making for greater individuality, rather than to group sentiments, who is most likely to succeed. And in one area, in

Robson's study, children were specifically discouraged from playing in the streets, thus the opportunity for the children to mix with and grow up in a child dominated world is effectively reduced. There were also a smaller number of children in this area and a bigger membership of Boy Scout organisations and of clubs and societies, where activities are controlled by adults. Robson concludes that the importance of the factor of street play is that it tends to work against the development of self-sufficiency in the individual.[76] He also argues that the middle class use of space is quite different from that of the working class. For middle class contacts and standards are not restricted to the local level, but derive from a much wider geographical orbit.[77] The standards which are internalised need not be taken from a group which is essentially local, but one disseminated through reading matter and other mass media.

Mercer,[78] in his discussion of the Newsomes work on child rearing as related to the four-year old in Nottingham, shows that the effect of space within the larger family, and the terrace house, results in the child playing out in the street more. This means less control by the mother over the choice of playmates, compared with the middle class; and less willingness to arbitrate in children's quarrels. It was suggested too that these attitudes persist for some time after moving out from the older terraced areas to council houses on new estates. The influence of environmental threats being just outside the terrace house, where there is no semi-private garden or yard, results in parental controls which are at first pervasively repressive, but when these fail, there is a fatalistic abdication of efforts to protect the children.[79]

There are thus behavioural characteristics related to both the physical features and the social milieu of the neighbourhood.

Other evidence about the street behaviour of children comes from a study on Road Safety. Here it was found that age was the single most important factor in determining whether children will play in the street, go on errands, ride a bicycle, walk to school on his own etc. The incidence of street playing was higher among boys than girls, among town dwellers rather than country children, amongst children who live in houses or flats without gardens than those who have a garden, and amongst children whose homes are on estates rather than those whose are not.[80] Those living on a modern housing estate were most likely to play in the street followed by those living in a street of older houses, mostly in poor condition.[81] More mothers of boys worry about road accidents than of girls. Mothers of girls worry about strangers speaking to or molesting them; but overall mothers of boys and girls mentioned equal numbers of worries.[82] The largest grouping in fatal and serious accidents to pedestrians was among six-year olds, and to pedal cyclists was among 14 year olds, in 1968. Amongst 8 year olds the proportion of children owning bicycles increased with the fathers income.[83] There was no difference between boys and girls of the same age as to the likelihood that they will make journeys either to buy sweets or to go on errands, and there was very little evidence that the social class of the child's father matters in this respect. However it seemed that children who occupy a middle position in their families are more likely to visit sweet shops and go on errands, than only children, youngest children or eldest children.

THE JOURNEY TO SCHOOL

The journey to school is obligatory, given that attendence at school is obligatory. The normal means of going to school is on foot, indeed it is the duty of the Local Education Authority to provide transport or pay travelling costs for a pupil if a school is not within walking distance of his home. Walking distance is defined here as 2 miles for those under eight, and 3 miles for those aged eight and over.

In 1972 about 10% of all pupils received free transport, 20% of secondary and $3\frac{1}{2}$% of primary school pupils; and nearly 70% lived within one mile of the school they attended. Amongst the secondary school children 44% lived within one mile of the school they attended, and 78.5% lived within the walking distance of three miles.[84]

In the 1968 survey on road safety about $\frac{2}{3}$ of the children walked to and from school.[85] Children from the higher social classes are the children most likely to go to and from school by car, and this seemed to be instead of walking rather than going by bus.[86]

Amongst those using school transport there was a considerable time spent waiting both before and after school. For primary school children there was a tendency to longer waiting before school; the secondary school children had longer waits after school, and on average waited longer than the primary school children.[87]

Of the children in the previously mentioned Road Safety study 13% went somewhere between leaving school and arriving home, and in addition 61% had left their own homes and gardens at some time after getting home on the day before the survey.[88] Children with older brothers and sisters were marginally more likely to play in the street than were other children.[89]

Lee was interested in the effect of the closure of rural primary schools, and he found that social and emotional adjustment at school in rural infant children was related to the journey to school. For those children who did not walk, but travelled by school bus, displayed less well adjusted behaviour, and Lee attributed this to a psychological cause. He concluded that this was a result of the children forming separate schemata for the two areas round home and round school. He suggested that the unavailability of transport home between the time of arrival and the time when due to leave school would remain a barrier even for the older child, so that the two areas would continue to be conceptualised separately.[90] For the walking child a 'causeway schema' is postulated linking the two areas of home and school.

This overview has discussed some of the studies of cognitive mapping and behaviour in urban environments. It is to an empirical study of children's behaviour and cognitive mapping, in a small town, and with particular reference to the journey to school, that this work will now turn.

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CHAPTER IV

Ulverston - The physical background to the study

The last two chapters have dealt predominantly with mental processes, and mention was made of the effect on cognition of certain urban topographical features. Particular urban layouts may promote particular behaviour, and familiarity will to some extent depend on frequency of use, whilst memory may also be affected by the significance or use of a place. This chapter therefore gives a brief description of Ulverston where the fieldwork was carried out. Roads may appear to be given undue significance in the following outline, but they will figure prominently in the research design and results in subsequent chapters.

Ulverston is a small market town with a population of about 12,000. It lies close to the north shore of Morecambe Bay and south of the Lake District hills, and straddles the main road from Lancaster and Kendal to the port of Barrow-in-Furness. Ulverston is also on the railway from Carnforth to Barrow which was opened in 1846. There remains a wide, deep canal $1\frac{1}{3}$ miles long from the sea, leading to three canal basins, but it has not been used for shipping since 1916, and is now used by anglers.

There is a landmark on the northern side of the town, Hoad Hill, which is 450 ft high and surmounted by a monument in the form of a lighthouse. It was designed as a sea mark and used for navigational purposes. From the summit are fine views over the town, Morecambe Bay and the Furness peninsula. The monument is visible from much of Ulverston and is mentioned here since it was used as a reference point for mapping exercises for this work.

The site of the old iron works, formerly one of the main industries of the town, on the bank of the canal, is now occupied by Glaxo Laboratories Ltd, the largest single employer in Ulverston with a work force of about 2,000. This lies to the east of the area covered by the street plan of the town. There are other industrial sites in and around the town, but most are situated on the eastern side.

For descriptive purposes Ulverston can be thought of in four zones from north to south. These are delimited by the main through road, the railway line and the boundaries of the extended Croftlands estate (see Fig. 4.1).

To the west of zone one, north of the county road, lies the cobbled market place with the war memorial in the form of a cross. Some of the surrounding shopping streets are narrow, and many of the houses have Georgian fronts. Also in this zone is the Parish Church (1540-1866), the hospital, the cinema and the post office. The Lower School (1900) is situated on Hart Street, at the eastern end of this zone. Near the Lower School are three parallel streets of terraced housing built about 1870-1900.

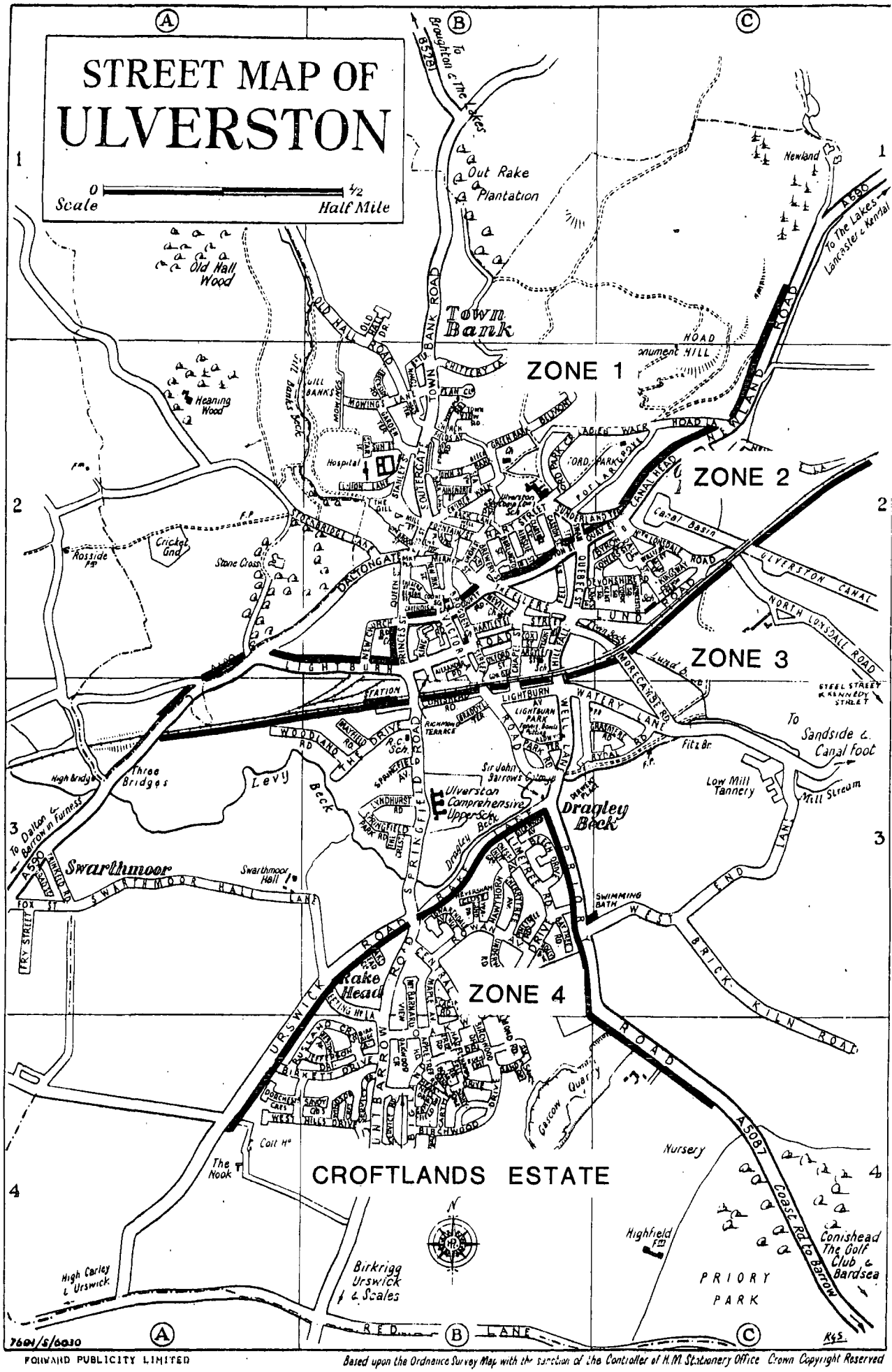
Zone two lies between the county road and the railway line. Just south of the road lies the library and police station, and then the bus station, the Roman Catholic church (1895) and the railway station, as well as the two junior schools Lightburn and Dale Street. There are some terraced streets near Lightburn School dating from about 1850-1880. At the eastern side is the Dale Street council estate built from 1919 to 1939, together with some terraced housing.

The third zone lies south of the railway line. To the west and just south of the railway there is a private development of largish

Fig. 4.1 Ulverston - street plan and zones.

The zones are as described in the text.

The street plan was that issued by the South Lakeland District Council during the period of the study.


STREET MAP OF
ULVERSTON
Scale 0 ½ Half Mile
A
B
C
1
2
3
4
To Broughton & the Lakes
B5281
Out Rake
Plantation
Old Hall Wood
Heaning Wood
Newland
A590
To The Lakes Lancaster & Kendal
OLD HALL ROAD
TOWN BANK ROAD
Town Bank
ZONE 1
ZONE 2
ZONE 3
ZONE 4
CROFTLANDS ESTATE
PRIORY PARK
Hospital
Cricket Gnd
Rosside
Stone Cross
DALTONGATE
QUEEN ST
PRINCES ST
KING ST
CHURCH ST
NEW CHURCH
STATION
LIGHTBURN AV
LIGHTBURN ROAD
WATERY LANE
MORECAMBE RD
Canal Basin
ULVERSTON CANAL
NORTH LONSDALE ROAD
LUND ROAD
Steel Street
Kennedy Street
To Sandside & Canal foot
Low Mill Tannery
Mill Stream
Three Bridges
High Bridge
Levy Beck
Dragley Beck
Ulverston Comprehensive Upper Sch.
Sir John Barrow's Grammar Sch.
Swarthmoor
Swarthmoor Hall
SWARTHMOOR HALL LANE
FOX ST
TRY STREET
SPRINGFIELD ROAD
WOODLAND RD
THE DRIVE
R.C. Sch.
Rake Head
URSWICK ROAD
LIMETREE ROAD
SWIMMING BATH
WEST END
BRICK KILN ROAD
A5087 Coast Rd to Barrow
Gascow Quarry
Nursery
The Nook
Coll H°
High Carley & Urswick
Birkrigg Urswick & Scales
Highfield Fm
Conishead The Golf Club & Bardsea
RED LANE
7604/S/6010
FORWARD PUBLICITY LIMITED
Based upon the Ordnance Survey Map with the sanction of the Controller of H.M. Stationery Office Crown Copyright Reserved

detached houses built from 1909 onwards; and further south still more private developments from the 1930s. On this westerly road south, out to the Croftlands estate, Springfield Road, lies the Upper School (formerly the Grammar School, built in 1932) in spacious grounds. The Roman Catholic junior school, St. Mary's, also lies on the Springfield Road. At the eastern end of this zone is the triangular Watery Lane council estate, built in the 1950s. (Fig. 4.2)

The fourth zone is the extended Croftlands estate, the north east end of which is council housing, built from the late 1950s to 1964. The southern and western part is private housing, some of the infilling being late 1960 and early 1970s.

The Croftlands estate is away from industrial sites and about one mile south of the Market Place. The newest junior school, officially opened in 1964, is on the estate, which is composed mostly of semi-detached houses with gardens, both privately and council owned. The swimming baths are on the edge of the estate, and there are a few shops and a public house serving the area.

From the map (Fig. 4.3) it will be seen that there are three roads out from the town to the Croftlands estate, viz. Springfield Road, Victoria Road and Well Lane. Because of the low clearance of the railway bridge on the most easterly road, Hill Fall, only the two westerly ones are bus routes.

In all 192 roads are listed on the street map of the town, and of these 47 may be described as being part of the extended Croftlands estate.

There are four junior schools :

Fig. 4.2 Ulverston - Council Housing
Source - South Lakeland District Council

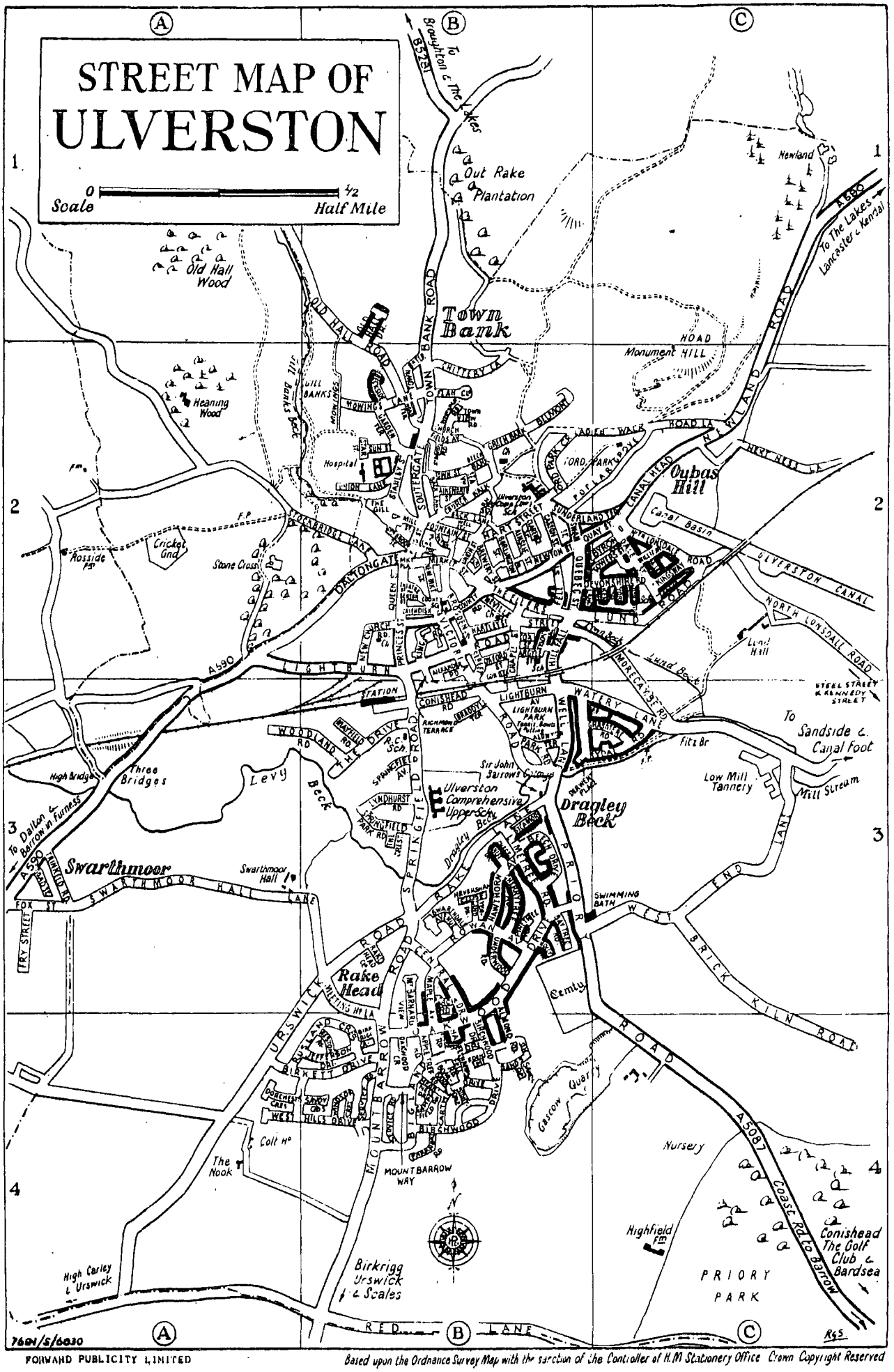


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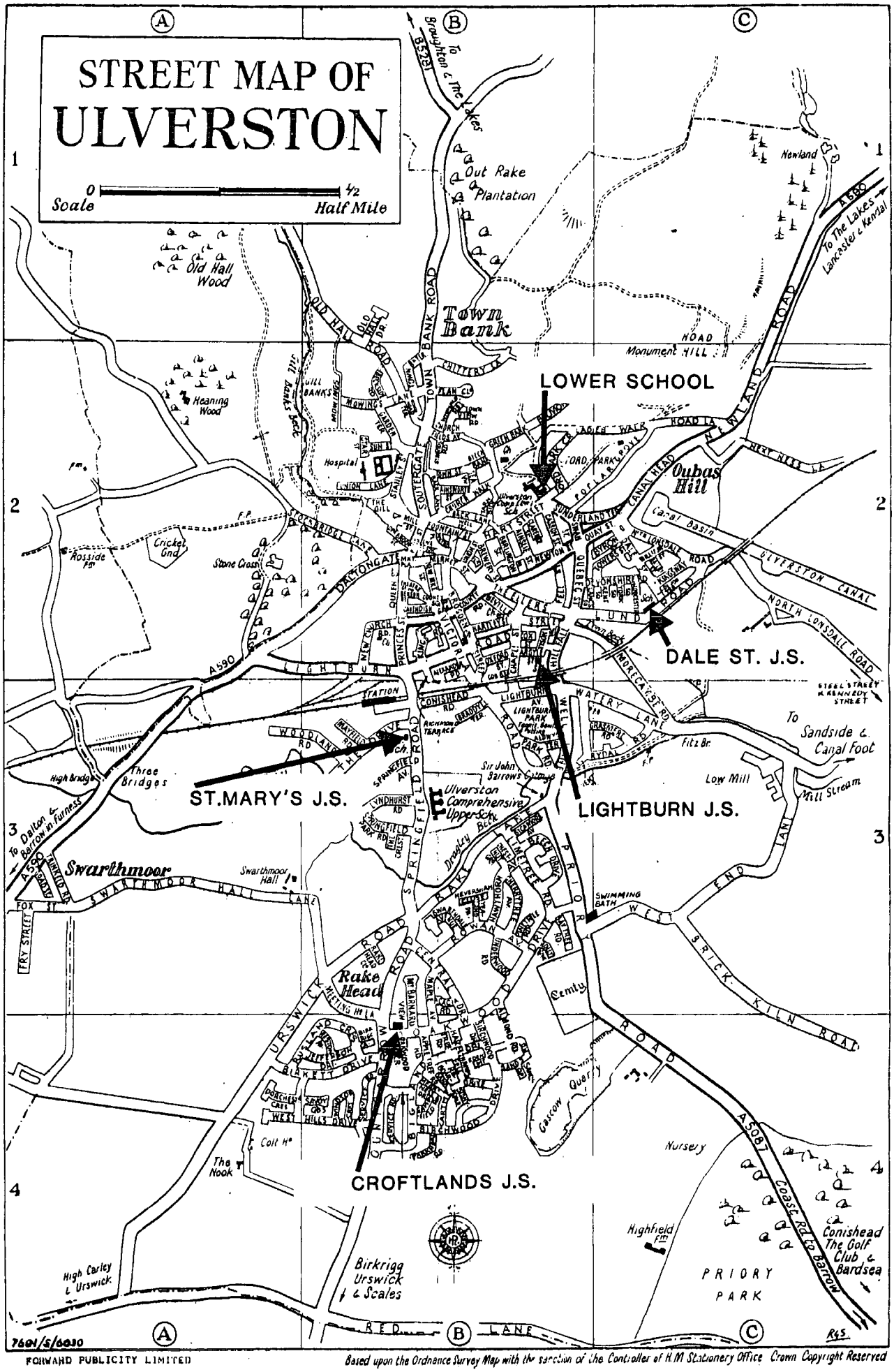
Fig. 4.3 Ulverston - Schools, Hoad Monument and Swimming Baths.

The schools are marked with arrows, the Hoad Monument is on the line between C1 and C2 and the Swimming Baths are on the line between B3 and C3.



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Croftlands Junior School	Mixed
Dale Street Junior School	Girls
Lightburn Junior School	Boys
St Mary's R.C. School	Mixed

Each has a very distinctive character and although these generally serve as neighbourhood schools, there are good reasons for individual children to attend a non-local school.

There is only one secondary school, the Victoria High School (Comprehensive) which is on two sites. The Lower School is on Hart Street, near the foot of Hoad Hill in zone 1, and the Upper School is on Springfield Road, zone 3.

During the first year at the Lower School the Geography curriculum is concerned with map work and with Ulverston and its surrounding villages. During the study of Ulverston some attention is given to the layout of the town and the children are taken on a town trail. They are also taken up to the Hoad Monument, where orientation to the north is discussed and the layout of the town and its position on the Furness peninsula can be seen. Such a teaching programme clearly influences any environmental information elicited from this age group; and is mentioned later, when discussing the fieldwork results to which attention now turns.

CHAPTER V

Croftlands School 1976 and 1977

Croftlands School 1976

INTRODUCTION

The areas surrounding the home and along the route of the journey to school are probably the most familiar parts of a child's environment; and it is here that children's different environmental knowledge can be studied. In this study children's sketch maps were examined in relation to a number of group and personal factors. Any regular relationships revealed by this study would indicate either consistent patterns of behaviour or consistent cognitive differences or both of these. Individuals differ in their knowledge of the environment and some of the possible contributing factors were investigated. Among these factors were sex, family use of car, gross rateable value of the home and type of ownership, as well as mode of transport for the journey to school, participation in organised out of school activities and journeys to go shopping to the town. Teachers were asked to assess certain dispositions for each child, and the data provided some evidence of certain other cognitive attributes.

Initial hypotheses

Although cognitive differences between the two sexes have been found on some psychometric tests which might affect environmental learning, behavioural differences have rather been taken for granted, so some questions were therefore included in order to help establish whether there were different behavioural patterns, due perhaps to greater parental control of the girls. The hypotheses to be tested

were that girls would like to go out and about less than boys, that they would tell an adult where they were going more often than boys, that they would go to bed earlier than boys, that they would go into the town unaccompanied less often than the boys, also they might use bicycles less than the boys; and that all or any of these behavioural constraints would limit their knowledge of the environment, by comparison with the boys. In the review of literature, studies were mentioned where the socio-economic class of the respondent appeared to influence their behaviour[1] or ability to draw sketch maps.[2] So further hypotheses were that children from a lower socio-economic group would draw more restricted sketch maps than those from a higher group; and that this would be associated with different patterns of behaviour. In particular it was postulated that children from a lower socio-economic group would travel by car less and less often engage in regular organised out of school activities. An alternative hypothesis was that restricted maps were associated with cognitive differences.

Although Ladd[3] found no relation between the distance from home to school and the neighbourhood size, it was intended to investigate this further, through testing the hypothesis that the sketch maps would be more extensive of those children who lived further away from, but who also walked to school, than for those who lived near the school. And it was a further hypothesis that mode of transport for the journey to school would influence environmental learning.[4] As well as the operation of group factors there was still the likelihood that strong personality factors might be a powerful influence on behaviour and cognitive functioning.

The hypotheses underlying the choice of personality dispositions were that attributes such as being observant, going about alone, being

confident, physically active, intelligent and generally good at school, would result in more extensive sketch maps; while attributes at the other poles i.e. being unobservant, socially inclined, timid, physically inactive, unintelligent and with poor general school attainment would result in the production of restricted sketch maps.

Experimental Design

In order to relate these factors to individual sketch maps, four instruments were used:

a) a questionnaire completed by each child (see Appendix I)

b) an assessment of each child completed by the teacher (see Appendix I)

c) a sketch map drawn by each child

d) a 'diary' of out of school activities, for a period of a week, kept by each child at school. (see Appendix I)

Additional information was obtained from the school records and from the records of the local Valuation Office.

The sample consisted of 74 children for whom all four documents were completed, in the top three classes of a primary school on the Croftlands estate on the edge of Ulverston. All the children were due to go on to the Lower School in the older part of the town in the following September. This study was carried out during July, 1976.

The teachers were very cooperative and the author was given plenty of time with each class. Almost all the children said they had completed their maps and appeared to have enjoyed drawing them. It was emphasised in the instructions that since each child lived in a different house and had different friends and occupations, each map would be unique.

Statistical Note

There are two points of view in analysing data from a study of this kind. The first is that this is a complete statistical population, for virtually all the children of this age in the school were included in the sample. Statistical measures from this group then become descriptive and are the values of the population parameters for this statistical population. In such circumstances an orthodox t-test, for example, for the difference between sample means for boys and girls is inappropriate; for it is sufficient to say that in this population one mean is larger than the other. In this case it is only possible to make wider generalisations when the same result is repeated over a number of populations.

The second point of view is that this group represents a sample from a wider population. What then is the wider population? - is it a hypothetical population of generations of 11 year old boys and girls from this area of Ulverston, if the latter, then in order to carry out an orthodox t-test, for the difference between means, the samples must come from approximately normal populations with equal variances. If these conditions are not satisfied there is a less powerful, non-parametric test which makes no assumptions about the underlying distributions; this is the median test.[5]

Although the author recognises that attitudes of schools and parents change over time, so that norms of behaviour change, it seems necessary to consider these samples as representative of some wider population if the results are to have any wider application. However the data is comprised of smallish samples with relatively small differences in measures of centrality and relatively wide dispersion.

Under these circumstances the median test is unlikely to establish significance; but the repetition of differences in the same directions (e.g. of boys indicating more roads on maps than girls) over a number of samples does give some justification for wider generalisation.

In each case the mean, standard deviation and number in the sample are given as a description and guide to the variability. Throughout the conventional probability levels of 0.05 and 0.01 have been adopted as levels of significance. In all cases the appropriate degrees of freedom are given as subscripts.

RESULTS

The results are summarised under the two headings, patterns of behaviour and environmental knowing, and in each of these sections both group and personal factors are considered.

Patterns of Behaviour

a) Sex differences

Within the group of 74 children there were 35 girls and 39 boys.

Asked whether they liked going out and about there was no significant difference between the proportions, but when questioned about telling an adult where they were going after school, more girls than boys did so (χ^2_1* = 4.24 $p < 0.05$ $N = 74$). On average the girls said they went to bed half an hour earlier than the boys; and on light summer evenings, as during the period of this study, this might limit the time for playing out.

For many of the questions there were no significant differences in the proportions of the various possible replies from the girls and from the boys. These items included: telling an adult where they were going when going out at the weekend; 'playing out' by themselves, with others or staying at home; and going on errands.

* χ^2 with 1 degree of freedom, see note above.

There were no differences recorded in the proportion of families having the use of a car or van as between the two sexes, nor for access to a bicycle by the children; though the only child who recorded no access to a bicycle was a girl.

The majority of the children (65 out of 74) walked to school and even more walked home (70 out of 74), with no differences between the boys and girls. However from the diaries it was clear that the mode of transport for the journey to school did not reflect the way the children got around when they were 'playing out'. For no children recorded that they went to school by bicycle, yet well over half the children (52 out of 74) recorded bicycle journeys during the week, with slightly more boys (28 out of 52) than girls (24 out of 52).

From the diaries it was also possible to test the hypothesis that significantly more boys than girls made unaccompanied journeys into 'town', but this was not supported for 14 boys made such journeys and 12 girls did so.

b) Socio-economic group differences

The two measures of socio-economic grouping used were obtained by reference to the home addresses and the rating office: these were the Gross Rateable Value of the property, and whether the house was privately owned or belonged to the local authority. The latter is a crude measure, but a simple dichotomy is useful in small samples. Within this group of children 54 lived in privately owned houses, while 20 were from council houses. There were no significant differences in the proportions of children in the two groups who told an adult where they were going when they went out after school or at the weekend.

Investigation of the availability of a van or car showed that there was a significant difference between the proportions of council and private house dwellers having cars ($\chi^2_1 = 6.9$ $p < 0.01$ $N = 74$) with fewer cars among those from council houses. From the diaries a comparison of the numbers of journeys made (excluding the journey to school) by car or by bus during the week also showed significant differences in proportions between the two groups ($\chi^2_1 = 5.75$ $p < 0.05$ $N = 74$), with those from council houses making fewer such journeys.

Mercer[6] mentions that the working class child is more likely to have more siblings and therefore to have less space in the home than the middle class child, and this may affect how much they 'play out'. In this study the average size of the family of the child from the privately owned house was 2.5 children, and from the council house 3.6 children.

From the diaries it was possible to compare attendence at organised out of school activities between the two groups. A significantly lower proportion of children from council houses had attended regular organised activities ($\chi^2_1 = 6.03$ $p < 0.05$ $N = 74$). However when considering attendence at 'events' (mostly at the weekend e.g. Sports Days, Flower Shows etc) although a lower proportion of council house children attended the difference was not significant. Proportionately more children from privately owned houses went into town, but the difference was not significant. However of those children who did go into town, the proportions of those unaccompanied and accompanied were significantly different between the two groups ($\chi^2_1 = 5.69$ $p < 0.05$ $N = 54$), with those from council houses more likely to be unaccompanied by an adult.

In summary then, some different patterns of behaviour were associated with sex and with socio-economic grouping as defined by the nature of home ownership. Girls seem subject to more control than boys but many of the differences did not reach statistical significance. Living in council owned property was associated with less likelihood of having the use of car, less likelihood of attendence at organised out of school activities, less likelihood of going into town, but if one did so, more likelihood of being unaccompanied into town; and with more siblings.

c) Individual factors

Although individual personality dispositions might appear to help to illuminate interpretation of either the maps or the reported behaviour of individual children, the overall categories were probably too vaguely defined and differently interpreted by different teachers. Inspection of the different teachers assessments did show a tendency, in the case of one teacher, for a large proportion of entries in the middle of the scale - such average marking may also reflect a 'don't know' response; and this was particularly noticeable on the physically active - inactive scale. In conversation with other teachers afterwards the author came to believe that this assessment was a difficult task for the teachers to carry out. The only objective measurement was that of general school attainment, as tests had recently been used and work assessed in preparation for the move to the Lower School. In fact the assessment of the children on six different dimensions each on a five point scale resulted in a very large number of individual personality profiles, of such variability that analysis would have required very much larger samples and more sophisticated methods.

As the most discriminating measure was general school attainment (see later results), this was examined in relation to sex, to private/council house dwelling and to attendance at organised out of school activities.

Although there was a tendency for girls to predominate in the higher attainment groups, this was not statistically significant.

Similarly the children from privately owned houses were better represented in the higher attainment groups, but again this was not statistically significant.

Consideration of the group who participated in organised evening activities showed that this group did include significantly more children from the higher attainment grades than among those children who did not so participate ($\chi^2_4 = 17.73$ p 0.01 N = 74).

Environmental knowing

a) Sketch maps and diaries

A simple measure of the extent of the maps drawn by the children is the number of roads indicated,[7] and this was employed. Where streets are not named it is seldom possible to identify all of them on the basis of their shape alone, for few of the children drew all the roads in a given area and it was often not clear which of two adjacent roads were noted. It was not therefore practicable to consider which roads were concerned, rather than how many. The children were asked to mark certain fixed points on the maps, for comparison purposes; so further measures were counts of the numbers of additional locations marked, and the numbers of named roads.

The diaries were examined to see if some measure of the home range[8] could be obtained from them, so that the extent of the children's

movement patterns might be related to the extent of their maps. In fact the numbers of roads and locations noted were so few that no estimation of home range was possible.

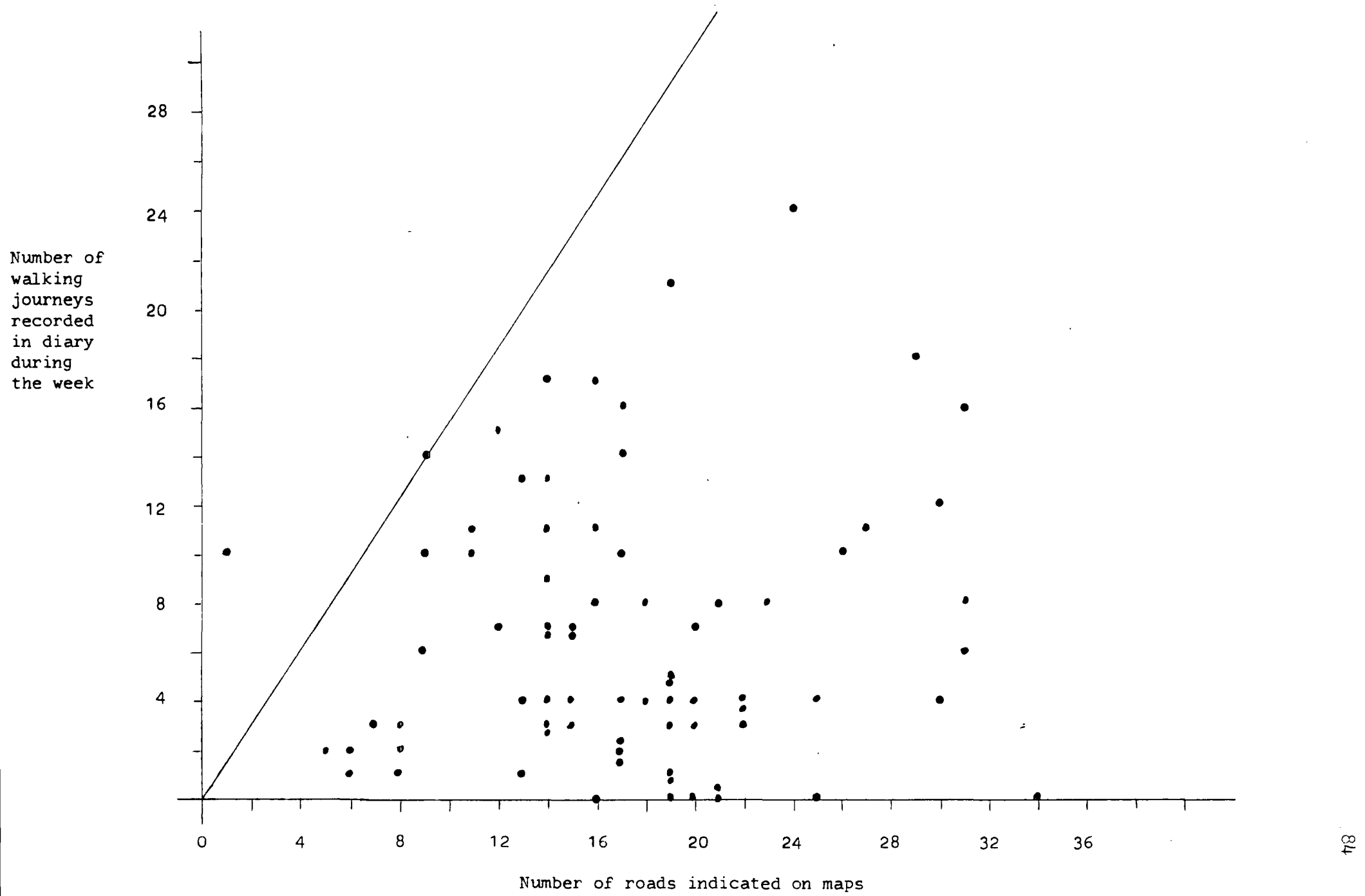
When the number of roads marked on maps was plotted against the numbers of journeys recorded on foot then a pattern was discernable. Although for each number of journeys recorded there were wide variations in the numbers of roads marked, the minimum number of roads appears to increase with the number of journeys, see Fig. 5.1. This leads to the conclusion that the activity of a child establishes a minimum knowledge of the environment, ie. the very active child cannot fail to pick up some knowledge; but that does not preclude the less active child from having a better memory for places and a more extensive map.

An extensive diary record might be considered a conscientious record; but it was found there was no clear association between number of words used and number of places mentioned; suggesting that lack of conscientiousness did not play a regular part in the entries with a low number of places noted. Attainment and number of locations (including named roads) were plotted and no regular association was shown, so that although recording was presumably easier for those of high attainment, they did not record more locations; and indeed there is no reason to suppose they necessarily had a more extensive movement pattern. Both these factors suggest the diaries were unbiased records of movement.

If the sparse entries for Fridays relate to a poor memory for events and places, is this related to the corresponding maps for these children ? Investigation of the numbers of roads on the maps for those children who failed to record any place on the Friday, reveals that the average number of roads for this group was 17.96, $n = 25$, and for those

Fig 5.1 Scattergram of the number of walking journeys recorded in the diaries during the week of the study, against the number of roads indicated on the map, for each child, Croftlands 1976.

Note: All but one of the 74 points lie below and to the right of the oblique line, which shows how the minimum number of roads increases with increase in the number of journeys.


Number of walking journeys recorded in diary during the week
28
24
20
16
12
8
4
0
4
8
12
16
20
24
28
32
36
Number of roads indicated on maps

who entered locations on the Friday in their diaries the mean number of roads was 17.8, n = 49, which gives no evidence to suggest that the failure to record a location on the Friday was associated with a poor general memory for places.

b) Sex differences

Comparison of the extent of the maps for the two sexes gave mean numbers of roads indicated by boys as 18.4, s.d. = 8.3, n = 39 and for girls 16.7, s.d. = 6.8, n = 35. The boys maps were both more extensive in general, but also more variable than the girls. The median test was non-significant. For the named roads the mean for boys was 4.5, s.d. = 4.9, n = 39 and for girls 5.8, s.d. = 3.9, n = 35. So the girls either knew more road names or were more concientious in naming their maps than the boys. Again the median test was non-significant.

The extra locations counted were only those places that had been named (e.g. Health Centre, Cinema etc.) and the mean numbers for boys were 4.3, s.d. = 3.0, n = 39 and for girls 6.2, s.d. = 4.0, n = 35. Again the girls generally supplied more names, but the median test was non-significant.

A comparison of the proportions of roads named from among those marked, showed that significantly more girls than boys had named more than half the roads they had marked ($\chi^2_1 = 3.95 \quad p<0.05 \quad N = 74$), which could be due to the girls greater verbal ability or to more attention to detail.

From the questionnaires it was possible to separate those children who regularly 'told' an adult where they were going from those who only sometimes did so, or did not do so. The numbers of roads were 17.7 n = 25 for those who 'told' and 17.5 n = 49 for those who did not, a

negligible difference. However if the girls figures are separated from the boys, the mean for those who told among the girls is 16.1 n = 21, and for those who only did so sometimes 17.6 n = 14 which though small supports the idea of greater control over movement for those who told. However the situation for the boys was reversed with those who told an adult where they were going having a mean of 20.1 n = 14, those who sometimes told an adult with a mean of 17.8 n = 22, while those who never told an adult had a mean of 14.7 n = 3. These figures are based on small numbers but are suggestive of sex differences. It could be hypothesised that 'telling' for boys was related to a greater articulation of their spatial knowledge reflected on maps.

Although the diaries did not serve the purpose for which they were originally planned, they provided some evidence on which to test further hypotheses, and gave an idea of individual differences.

Examination of the diaries showed that the girls on average used more words per day, with a mean of 28.7, s.d. = 5.3, n = 35, than the boys, with mean 23.6, s.d. = 4.3, n = 39. In this case the median test was significant at $p < 0.05$. But an examination of the number of different locations recorded (including named roads) showed no significant differences between boys and girls ($\chi^2_4 = 4.9 \quad p > 0.05 \quad N = 74$), however when road names alone were considered the girls were seen to have named significantly more ($\chi^2_4 = 10.3 \quad p < 0.05 \quad N = 74$), which parallels the results from the maps.

From these results it appears that boys know, on average, and can arrange on maps, a greater area of their environment than girls. This could be due to wider activity fields or to their greater spatial ability or to both these factors. The girls evidently know more names

of the roads they mark on their maps and this could be due to their greater verbal ability, which was demonstrated in this study by the greater number of words they used in their diary entries; or it could be associated with telling adults where they were going, or it may be the kind of details girls notice.

In fact an inspection of the numbers of roads named by the girls who told an adult where they were going gives a mean of 5.8 which is the same as for those who only sometimes 'told' an adult, so that regular 'telling' seems not to be related to the propensity of girls to name roads.

c) Socio-economic group differences

Comparison of the mean numbers of roads marked by the children from privately owned houses and from council houses gave for those from privately owned houses a mean of 17.6, s.d. = 7.5, n = 53 and for those from council houses a mean of 17.1, s.d. = 8.0, n = 20, but the median test was not significant. The slightly more extensive sketch maps of those from privately owned houses would be expected from the literature, and might reflect both cognitive and behavioural differences. For named roads the privately housed children had a mean of 4.8, s.d. = 4.00, n = 53 and the council house children a mean of 5.8, s.d. = 5.6, n = 20, with again, a non significant median test. The ratio of boys to girls in the sample is approximately the same in both groups, for the children from private housing it was 28:25 and for those from council houses it was 11:9; so the difference in number of named roads is not due to the influence of girls in the sample. Perhaps the less widespread ownership of cars means that smaller areas are known, but these areas are known in greater detail, by the children from council houses.

Inspection of the numbers of roads marked on their maps by children who attended regular organised out of school activities gives a mean of 18.7, s.d. = 5.7, n = 32, while for those who did not participate in such activities the mean numbers of roads were 16.8, s.d. = 8.7, n = 42; another difference which was not significant in the median test.

Attendance at organised out of school activities was more frequent among the higher attainment groups, and those from privately owned housing, as previously mentioned; and both of these are associated with more extensive sketch maps.

The mean number of named roads for this group was 6.5, s.d. = 4.8, n = 32 and for those who did not participate in organised activities the mean number of named roads was 4.0, s.d. = 3.9, n = 42 which gives a significant difference in the median test $p < 0.05$. This result may well be a reflection of the higher attainment amongst the group who attended organised out of school activities.

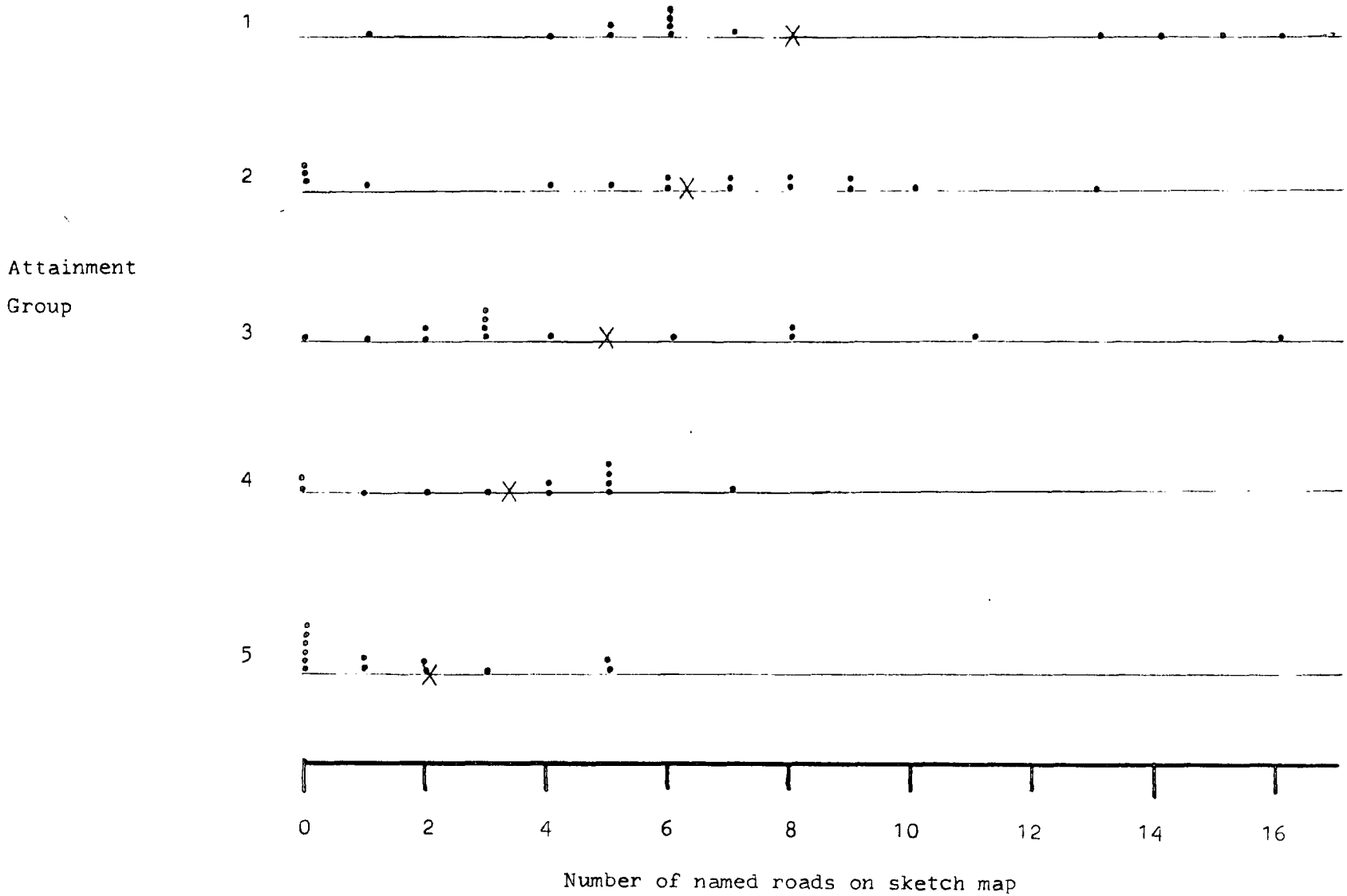
This group then had both more extensive maps and more named roads on their maps.

d) Individual factors

Plotting the numbers of roads marked on the maps against each of the six personality dispositions showed no regular patterns. However when the number of named roads was plotted against general school attainment, there was a clear association with more roads named by the children in the higher attainment groups (Fig. 5.2). An analysis of variance gave a highly significant value of F for variance between attainment groups $F_{4,69}^{*} = 5.70$ $p < 0.01$ $N = 74$, confirming the visual analysis.

* F ratio with 4 and 69 degrees of freedom. See note on page 77

Fig. 5.2 Scattergram of number of named roads on sketch maps by attainment group, Croftlands 1976.
The mean value for each attainment group is marked with a cross.


1
2
Attainment
Group
3
4
5
0
2
4
6
8
10
12
14
16
Number of named roads on sketch map

In the diaries many other facets of individual personality dispositions were displayed, and some of these have been linked with the field dependent - field independent developmental continuum by Witkin et al.[9] These included, at the field dependent end such aspects as 1) lack of articulation about experience (e.g. 'played out') 2) poor organisation of material in memory (e.g. fragmentary maps) 3) passivity (watched T.V.) and 4) oral pleasure and self indulgence (e.g. bought sweets) and at the field independent end 5) articulateness about experiences and 6) setting one's own goal (e.g. girl who went to feed the goats at the tip, boy who went out looking for wheels for a buggy). It was not however possible to link these vague indicators together or with any of the social or emotional factors identified by teachers. Five of the children were classified as very timid and the map of one of these was very restricted, but the other maps fell in the middle range. The girl who recorded the longest walk, a distance of six miles through the lanes to Barrow, did not draw a very extensive map. So examination of some of the extremes in this case gave no guide to a wider interpretation as it sometimes may.

e) Direction and distance

Two other aspects of specific psychological functioning were examined in relation to the maps, these were distance and direction. Measurement of the Home - School direction and of the School - Hoad Monument direction produced histograms showing considerable variability but each with a flatish central portion. When measuring these angles it was necessary to adopt a base line from which to work; and the line of School - Swimming Baths was used, since all the children had put these two points on their maps and regularly went from the school to

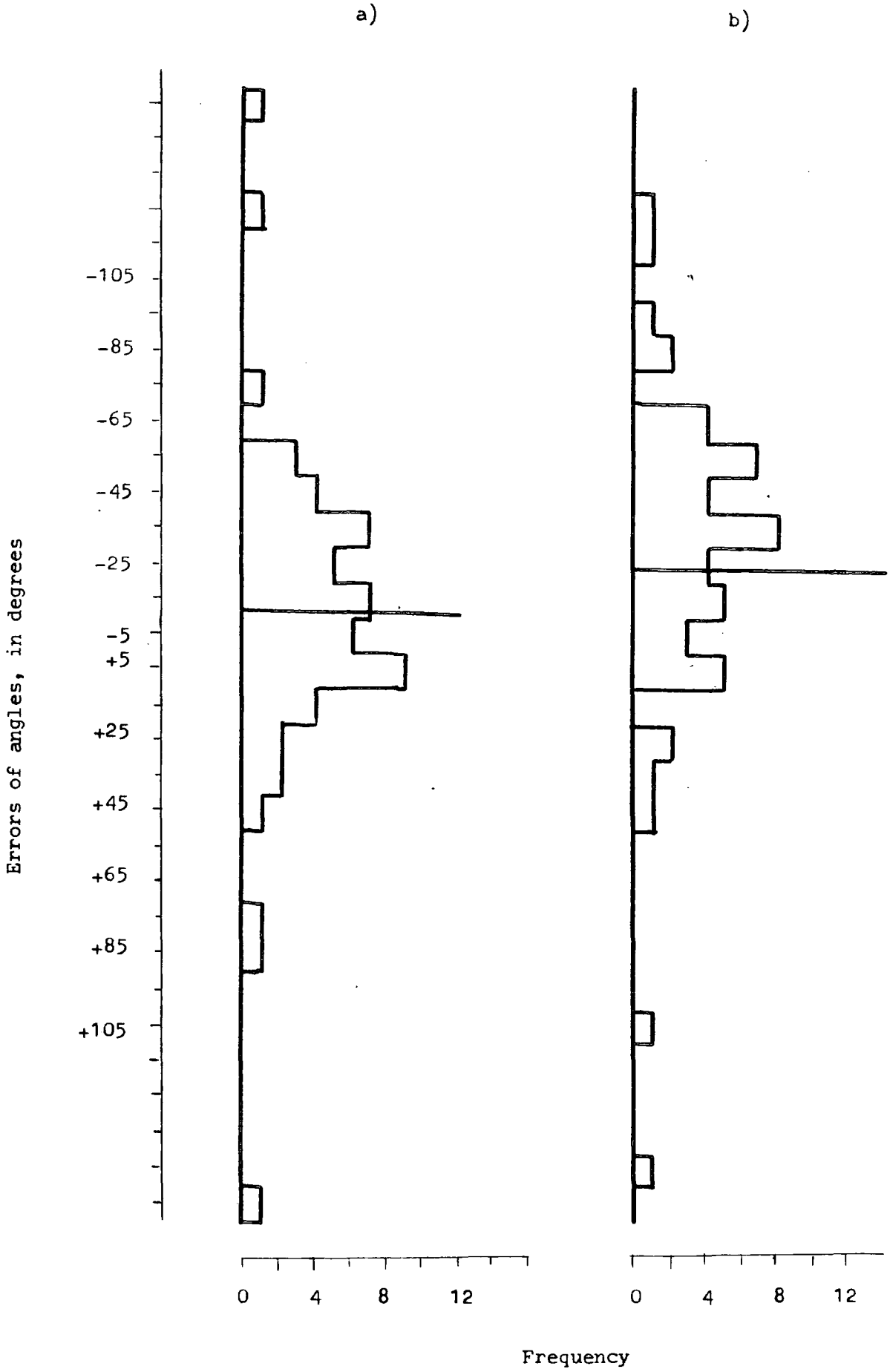
the swimming baths for swimming lessons. The Hoad Monument was easily visible from the school playground and its direction from the school was the same for all the children, so that a 'normal' distribution of errors might be expected. For the estimation of the direction of home from school each child was estimating a different angle, since each home was uniquely located, but again the errors in such estimations could be expected to be normal. In fact the two distributions were similar in shape but whereas the mean for the distribution of errors for the Hoad Monument was at about 28^{o} in an anticlockwise direction, the mean for the distribution of errors in the home direction was 11^{o} in an anticlockwise direction (see Fig. 5.3.). To find the errors the 'true' angles were measured from an O.S. map of appropriate scale - i.e. where the town fitted comfortably onto a sheet of A3 paper - the size given to the children on which to draw their maps.

These histograms show that there were systematic processes at work, and while individual children might judge their position more or less accurately according to the Hoad Monument, a visual referent, others were more accurate for the Home - School 'experiential' referent. For the latter, their sense of direction had built up over many journeys round corners and through the built environment. Only a few had nearly accurately portrayed both directions on their maps (7 out of 52 had combined errors on the two measures of less than 30^{o}). The result is interesting for clearly the children at this age have a definite sense of direction which they incorporate on their maps. The bias to an anticlockwise direction is difficult to explain unless it is associated with the choice of base line. The further point, the Hoad Monument,

Fig. 5.3 Distribution of errors in the angle of Direction of the Hoad Monument and of home, Croftlands 1976

a) Errors in angle of direction of home
b) Errors in angle of direction of Hoad Monument

The mean values are marked with a line


a)
b)
Errors of angles, in degrees
-105
-85
-65
-45
-25
-5
+5
+25
+45
+65
+85
+105
0
4
8
12
0
4
8
12
Frequency

was on average depicted as further displaced than the position of the homes, which were usually less than half the distance away of the monument.

To investigate the variation in scale employed over the extent of the map various measurements were taken from the children's maps. As each child had been asked to mark the position of their home, the school, the Swimming Baths and the Hoad Monument, these were used as points of reference. As the Hoad Monument was clearly visible from the school playground, estimates of its distance could be on a visual judgment, or on the memory of the experience of going to it through the town, or on a mixture of both.

The distances used were Home - School, which was different for each child, School - Swimming Bath, and School - Hoad Monument, which were constant. In each case a scale ratio was calculated, that of the distance drawn by the child divided by the actual distance as marked on an Ordnance Survey map. If a distance decay function was operating perhaps the distances to points near home were respresented as relatively larger than those further away. The children actually drew the maps at school, so perhaps the school could have been the origin. Considering the three distances: School - Home, School - Swimming Baths, School - Hoad Monument, was the shortest distance portrayed as the largest ? or was the Home - School distance portrayed as the largest even when it was not the shortest ? i.e. was the Home the origin ?

Ranking the three distances according to actual size, there were 36 for which the scale ratio decreased as the actual distance increased, and 26 for which they did not. Testing against a null hypothesis of equal likelihood for increasing or decreasing scale ratio gives a

($\chi^2_1 = 1.6$ $p > 0.05$ $n = 62$) which was not significant. However if the hypothesis that the Home - School distance is portrayed as the largest is adopted, the figures become 42 where it is and 20 where it is not, and this gives ($\chi^2_1 = 7.8$ $p < 0.01$ $n = 62$) which is highly significant. If the majority of the children were at the domicentric stage, with home as origin, then this is evidence for a distance decay function of scale ratio.

In the diaries the children had given a variety of reasons for going to school, and it was decided to see if the scale ratio adopted was in any way related to expressed attitudes to school, for preference has been shown to have an effect on distance estimation in the retailing context.[10] Another more potent influence on scale ratio might be the distance of home from school, so a table of mean values of the scale ratios was constructed. It was not possible to carry out a cross classified analysis of variance because the numbers in the different groups were unequal, but the values in the margins of the table are suggestive of the effect of the home - school distance, while no systematic effect can be attached to the influence of attitudes to school broadly categorised as 'work' 'learn' and no entry.

Mean Values of Scale Ratios of Distance from Home to School, Croftlands 1976

Distance Home - School from map in cms	Attitude from Diary: Work	Learn	No entry	Group Mean	Number
1.0 - 1.9	5.3	6.1	4.2	5.5	7
2.0 - 2.9	3.9	4.4	4.3	4.3	20
3.0 - 3.9	3.5	3.3	3.2	3.4	18
4.0 - 4.9	1.7	2.1	2.2	1.9	7
5.0 - 5.9	1.9	1.9		1.9	2
Group Mean	3.5	4.2	3.8		
Number	22	12	20	N = 54	

Table 5.1 Mean values of scale ratios, of the distance from home to school, classified by attitude to school and distance of home from school (measured in centimetres from the O.S. map), Croftlands 1976 N = 54

This gives further support to the hypothesis of a distance decay function for scale ratio.

SUMMARY

Investigation of behavioural patterns and sketch maps of children showed that the differences in behaviour patterns as revealed by questionnaires and diaries, and associated with sex and socio-economic differences on this estate are slight, though there seem to be some differences in the maps drawn by these different groups. The mode of transport for the journey to school was unrelated to the transport used for most other journeys and may not have been very influential in environmental learning. However frequent walking journeys were associated with higher minimum numbers of roads on maps.

Higher average numbers of roads on sketch maps were associated with boys, children from privately owned housing, and those who engaged in organised out of school activities. Higher average numbers of named roads on maps were associated with girls, children of higher school attainment and those from council housing. It seems that those who drew less extensive maps marked more road names on them.

There was some evidence to support a moderate general ability to represent direction on maps, both of a visual landmark and of home. There was also evidence which might be interpreted to support the postulate of a distance decay function with respect to scale, based on the home area as origin.

Croftlands School 1977

INTRODUCTION

Two aims had been in mind for this study

1) to repeat investigations of patterns of behaviour and of sketch maps in relation to factors such as sex, socio-economic group, attainment and out of school activities inter alia, and to see if the relationships suggested by the earlier study applied to this, next, cohort of children

and 2) to examine some aspects of the change in environmental knowing associated with the move to secondary school.

The data collected in 1977 was incomplete, for though this had been planned as the main study the author became ill after two days fieldwork and so was unable to carry through the whole programme. All the work on those two days was carried out at Croftlands School and served as a means of testing further some of the results obtained there the previous year. It also provided a set of maps drawn by children who would move to the Lower Comprehensive School the following year, and from whom another set of maps could be obtained. The work was done on June 27th and July 1st 1977.

As always documents for individual children were not always complete, and the final sample consisted of data on fifty six children. Examination of the characteristics of those omitted showed they were spread over the full ability range and were of both sexes, and from all three forms, so their omission should not bias the results.

Experimental Design

The data consisted of a map drawn at school and a questionnaire answered by each child, an assessment of general attainment by the

teacher, their home address from the school records, and the Gross Rateable Value and whether the house was privately or council owned from the local Valuation Office.

The questionnaire omitted questions on items set the previous year which had failed to discriminate between the different groups; but included those where trends had been indicated or statistically significant results had been obtained, in 1976. (see Appendix II)

RESULTS

Patterns of Behaviour

The only personality disposition elicited for this study was the general school attainment, and examination of this factor as between boys and girls showed that there was a tendency, also noted the previous year, for the girls to predominate in the higher attainment groups, though this was not statistically significant. There was also a tendency for children from privately owned housing to fall into the higher attainment grades, and from council housing into the lower grades, but again this was not significant, though the same effect had been noted the previous year.

Investigation of the incidence of 'telling' showed that more girls than boys more often told an adult where they were going after school, and this was significant ($\chi^2_1 = 4.15 \quad p < 0.05 \quad N = 56$); but at weekends the differences were not significant, for more of the boys told an adult where they were going, perhaps because they would be out for longer, and these results repeated those of the previous year.

As in the previous year significantly more girls than boys named over half the roads they had marked on their maps ($\chi^2_1 = 8.74 \quad p < 0.01 \quad N = 56$).

An analysis of variance of numbers of roads named, by attainment group, gives a highly significant Between Attainments Mean Square Ratio ($F_{4,51} = 3.87$ $p < 0.01$ $N = 56$), with the higher numbers of roads named associated with the higher attainment group. This also confirms the relationship noted the previous year; and with the generally higher attainment of girls might account for some of the sex difference.

Environmental knowing

Again using the numbers of roads indicated on their maps as a measure of the extent of their environmental knowledge, gave similar results to those of the previous year. As before, on average, the boys marked more roads on their maps with a mean number of 27.12, s.d. = 11.5, n = 25, than the girls whose mean was 17.36, s.d. = 5.4, n = 31, which gave a highly significant result with the median test $p < 0.01$; but, for the numbers of named roads the order was reversed and the girls named an average of 10.71, s.d. = 4.1, n = 31 and the boys 10.04, s.d. = 6.6, n = 25, which resulted in a non-significant median test, and this repeated the finding of the previous year. However, when the average number of roads indicated by those living in council and privately owned housing were compared the order was reversed from the previous year, for the council house children had the higher average of 23.56, s.d. = 10.4, n = 9 and the private house children had an average of 21.76, s.d. = 9.8, n = 47, though the median test was non significant. For named roads the average for council house children was 8.8, s.d. = 6.7, n = 9 and for private house children it was 10.5, s.d. = 5.3, n = 47, with another non significant median test. Further investigation of the numbers of boys and girls in these two groups showed that in the council house group the ratio was 6:3 and in

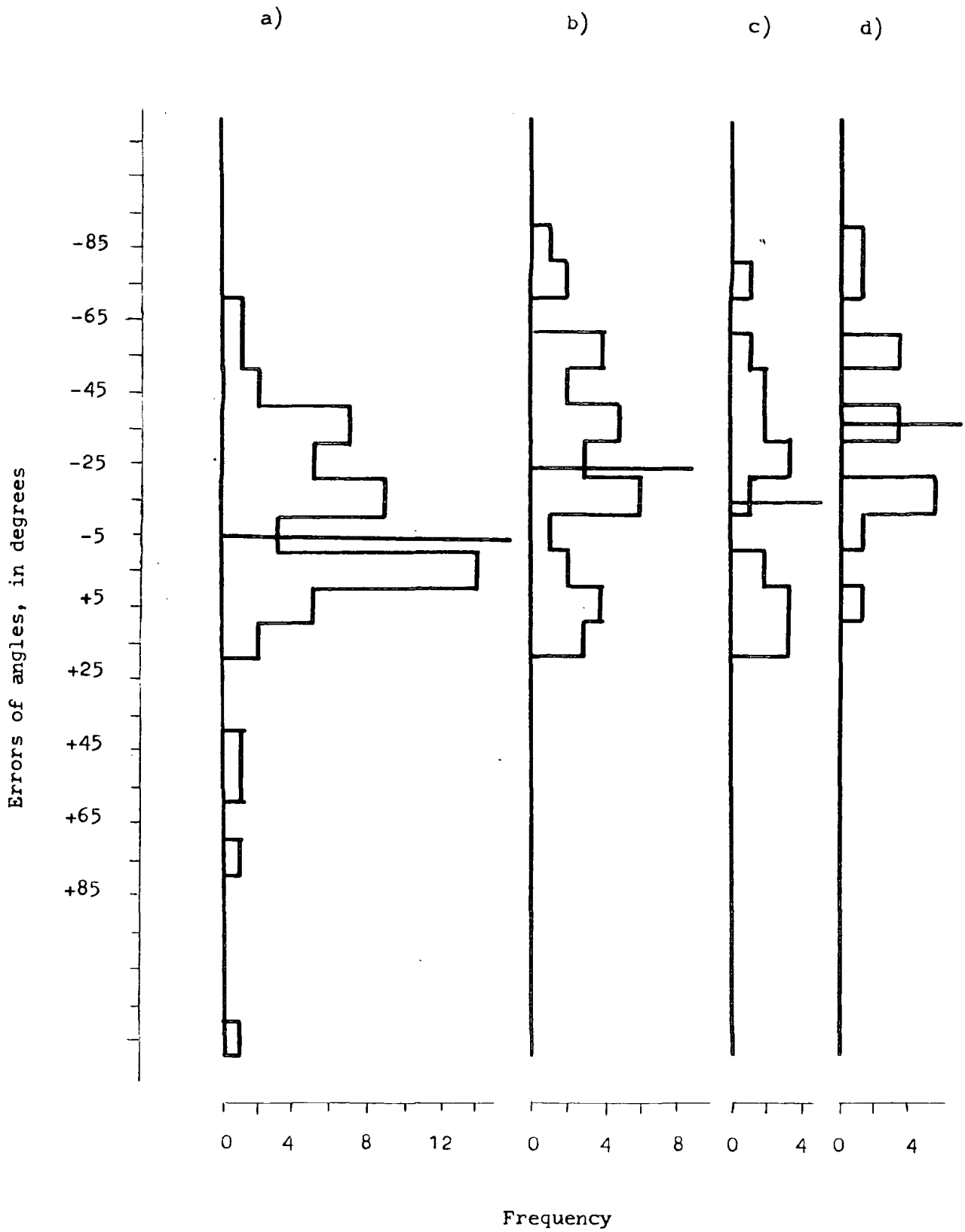
the private house group 19:28; these sex ratios would serve to increase the mean number of roads marked by the council group and decrease the mean for the private group; and vice versa for named roads; but, indeed, comparisons are dubious with such sample sizes.

As in the previous year measurements of orientation were taken from the maps. The average errors in the estimation of the direction of home and of the Hoad Monument were surprisingly similar to those in 1976. The mean error for direction from home, which was different for each child, was 13.0° in an anticlockwise direction, and the mean error for the direction of the Hoad Monument was 33.6° in an anticlockwise direction; these were 10.8° and 28° respectively in 1976. An additional question was included on the questionnaires as to whether the Hoad Monument was visible from the child's home or not, though for all children it was visible from the school playground. Not all the children had marked the Hoad Monument on their maps, but for those for whom it was visible from home, 20 had included it and 13 omitted it, while for those for whom it was not visible from home, 15 had included it and 8 omitted it. A chi-squared test showed no association between being able to see it from home and including it on the map ($\chi^2_1 = 0.12$ $p > 0.05$ $N = 56$), so that analysis of the errors in direction of the two groups would not be biassed by the omissions. For those who could see the Hoad Monument from home the average error was 24.5° in an anticlockwise direction and for those who could not it was 44.5° in an anticlockwise direction. Clearly those children who see it from home as well as from school have a better idea of its direction. This does not explain why both directions err in an anticlockwise direction, and perhaps this is somehow due to the base line used for the measurements, i.e. the line joining the school to the swimming baths. This

Fig. 5.4 Distribution of errors in the angle of direction of the Hoad Monument, and of home, Croftlands 1977.

a) Histogram for errors in the direction of home
b) Histogram for errors in the direction of the Hoad Monument
c) Errors for those children who recorded that the Hoad Monument was visible from home
d) Errors for those children who recorded that the Hoad Monument was not visible from home

The mean values are marked with a line


a)
b)
c)
d)
-85
-65
-45
-25
-5
+5
+25
+45
+65
+85
Errors of angles, in degrees
0
4
8
12
0
4
8
0
4
0
4
Frequency

was chosen because all the children had marked both places on their maps and they were known to visit the baths weekly, with the school (see Fig. 5.4).

Measurements of the scale ratios of distances were also obtained from the maps. The children had been asked to mark their home, the school, the swimming baths and the Hoad Monument on their maps; but as mentioned already some 21 had failed to include the latter.

The hypothesis to be tested was whether there was a distance decay function operating for the scale ratio based on home as origin, i.e. were the shorter distances from home depicted using a larger scale than the longer distances. Ranking the home - Junior School distance and the home - Swimming Bath distance, it was found that 43 children employed a larger scale for the shorter distance, and 13 did not ($\chi^2_1 = 16.07$ $p < 0.001$ $N = 56$). If a similar computation is carried out for the school - home and school - swimming baths, distances, 44 children adopt a larger scale for the shorter distance and 12 do not. Again this is a highly significant result statistically, ($\chi^2_1 = 18.28$ $p < 0.001$ $N = 56$). There is evidence then that a distance decay function does operate. Of the 56 in this group 7 did not conform to a distance decay function with either home or school as origin; 4 conformed with only the school as origin, and 5 with only the home as origin, whereas the remaining 40 were consistent with this pattern with either home or school as origin, suggesting that for these the origin lay in one general area including them both.

From the earlier study it had been suggested that preference might influence scale ratio adopted, though no evidence had been found to support this. In order to investigate this possibility more systematically the children were asked to give their preference for school and for swimming on a five point scale.

As with the data the previous year it was not appropriate to carry out an analysis of variance due to the unequal numbers in the groups, but the margins of Table 5.2 do give some support to the influence of distance from home, and the postualte of a distance decay function in relation to scale, and to the effect of prefernce, though in both cases the first group is anomalous. However some of the numbers are very small, and therefore generalisations should be cautious.

Distance Home - School in cms	Attitude to School 1	2	3	4	5	Group Mean	Number
0 - 0.9	3.9					3.9	2
1.0 - 1.9	3.6	7.2	2.5	5.8		5.4	10
2.0 - 2.9	4.8	4.3	4.8			4.6	18
3.0 - 3.9	4.0	4.7	4.7	3.0		4.3	16
4.0 - 4.9		2.4	3.0	3.8		3.7	3
5.0 - 5.9		3.4				3.4	1
6.0 +		2.7	3.5		2.8	2.5	6
Group mean	3.4	4.7	4.4	4.2	2.8		
Number	16	24	12	3	1		56

Table 5.2 Mean values of scale ratios for the distance to school, classified by attitude to school and distance of home from school.
On the attitude scale 1 indicates a wish to attend school daily, and 5 a wish never to attend school.
The distance from home to school is measured in centimetres for the O.S. map.
Croftlands 1977 N = 56

Attitudes to swimming were also requested on the questionnaires, because the children attended the swimming baths regularly once a week with the school, and so this provided the opportunity for a similar analysis. However, as can be seen from Table 5.2 the results were

less clear both on the distance scale and on the attitude scale, though there is a general trend of decreasing mean scale ratio with increasing distance from home.

Mean Value of the Scale Ratio of Distance from Home to Swimming Baths, Croftlands 1977

Distance Home - Swimming Baths in cms	Attitude from questionnaire 1	2	3	4	5	Group Mean	Number
0 - 0.9							
1.0 - 1.9	6.1		5.3			5.7	2
2.0 - 2.9	3.7	5.8				4.8	2
3.0 - 3.9	3.2	2.9				3.1	3
4.0 - 4.9	4.0		2.5	5.8		4.1	8
5.0 - 5.9	2.4		2.8			2.5	7
6.0 - 6.9	3.4	3.6	2.8			3.3	15
7.0 - 7.9	2.6					2.6	5
8.0 - 8.9	2.3		2.4			2.3	7
9.0 - 9.9	2.7		2.9			2.7	3
10 +	1.9					1.9	4
Group mean	2.9	3.8	3.0	5.8			
Number	41	6	8	1			56

Table 5.3 Mean scale ratios for the distance to Swimming Baths from home classified by attitude to swimming and by distance of Swimming Baths from home (measured in centimetres from the O.S. map)
N = 56
On the attitude scale, 1 indicates that going swimming was liked very much and 5 indicates that it was not liked.
Croftlands 1977

The children however probably knew the position of the swimming baths less well than the position of the school; and preference will have been linked to familiarity; for those who liked swimming will have gone there more frequently.

SUMMARY - Croftlands 1976 and 1977

These two preliminary studies have revealed some consistent patterns of behaviour and attributes of sketch maps as between two successive cohorts of children attending the top classes of a junior school on the Croftlands estate on the outskirts of Ulverston. Some sex and socio-economic differences were established as statistically significant, others did not reach the necessary probability level in these group sizes; but where the same trend has been noted in both year classes it is suggestive of an underlying regularity which might be demonstrated at a more critical level in a larger group. Whereas the boys tend to draw a more extensive area of the town, the girls are more likely to name more roads. Although some of this difference may be due to more extensive movement patterns by the boys it also seems to reflect cognitive differences. There was a wide scale variability over the maps and much of this could be explained in terms of a distance decay function operating with the home as origin. It could be argued that many of the children were at a domicentric stage and had adopted a scale ratio which decreased with distance from home. There was a wide scatter of errors in the estimation of direction through the built environment, as depicted on the maps, but this error tended to be less than that for the visual judgment of direction of a landmark at about $1\frac{1}{2}$ miles from the school; the results from the two year classes were remarkably similar and suggest some systematic processes at work. There was insufficient evidence to support the association of preference and scale ratio.

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CHAPTER VI

Victoria High School, Lower School, 1978

This chapter will deal largely with quantitative results: the next chapter will deal with illustrative material from selected individuals, in order to give some idea of the qualitative aspects of the data.

The final study, at the Lower School in 1978 was intended to shed further light on the role of behavioural and cognitive factors in environmental knowing especially in relation to the patterns of journeys to school. The specific aims were :-

1) to confirm, if possible, associations of behaviour with environmental knowledge especially in relation to sex, socio-economic differences, attainment, mode of transport for the journey to school and attendance at organized out of school activities.
2) to compare results obtained by two different measures of the extent of environmental knowledge from sketch maps and from lists of streets.
3) to investigate the differences in knowledge of the town by the children in the first year of the Lower School drawn from the four town junior schools, and from country schools.
4) to examine some of the developmental aspects of environmental learning by comparison of data from the Croftlands intake to the Lower School, with data from the same children collected in 1977.

Sample Sizes

Throughout this study the sample sizes employed in the analysis vary. This was because each time the data from the maximum number of children appropriate for a particular purpose, were employed.

Lower School

The original sample was intended to include all eleven first year forms at the lower school (i.e. IAg, IAk, IAt, IA/B, IBg, IBt, IBx, IBk, ICg, ICk, and ICt) over the two visits.

Owing to circumstances beyond the author's control, no return visit was made to IBk, so some data from this form were omitted from the study.

For various reasons some children were present on the first visit and not on the subsequent visit, and vice versa, so their data were also removed.

When listing the names of roads known it was decided to ask pupils in classes IAk, IA/B, IBt, IBx, ICg, ICk and ICt to list by free recall; in classes IAg, IAt and IBg to list under alphabetical headings, for it has been suggested that the initial letter may act as an aid to memory.

However the alphabetical lists clearly involved two processes, recalling, and categorising, and in general were in fact shorter than the free recall lists of the corresponding classes. It was therefore decided to omit the data from these classes from analysis of 'list' data, for quantitative measures of environmental knowledge.

Because behaviour patterns are likely to be different in the country, all considerations of the effect of type of housing were limited to the children living within Ulverston.

Individual children failed to comply with some instructions e.g. putting all the reference points on the maps, answering all the questions on the questionnaires and so individual data may be missing from certain results. Amongst the C groups some of the 'maps' were 'pictures' and were not amenable to measurement or quantifying. Only

one child marked his list of roads 'unfinished' whereas several children marked their maps unfinished - these were omitted when appropriate; though it was possible to make some observations and measurements from such maps.

Throughout, inspection of the characteristics of rejected data was made to see if these omissions would introduce bias into the results; where this was likely notes have been made accordingly.

As a result sample sizes vary considerably, in each case the size is given without a detailed discussion of the criteria for inclusion or rejection.

INITIAL HYPOTHESES

From the earlier studies it was predicted that there would again be differences in patterns of behaviour associated with the sex and socio-economic group of the children. Likewise there would probably also be differences in environmental knowing as displayed on sketch maps.

Behavioural Patterns

The specific hypotheses incorporated into the design of the questionnaires, and capable of being tested against the data collected, are outlined below.

Considering first the differences associated with sex; these were expressed as hypotheses that the girls would more often tell an adult where they were going when they went out, than the boys would. And with the generally longer journey to the secondary school, it was postulated that more boys than girls would travel by bicycle, and more girls than boys would be taken by car. From the previous results

it seemed likely that more girls, at this age, would fall into the higher attainment bands.

Turning to the differences associated with the socio-economic grouping of the children, some of these were likely to be related to the mode of transport for the journey to school and for visiting relatives. In particular it was postulated that fewer children from council than from private houses would be taken by car for both these types of journeys. And it was postulated that there would be fewer children from council houses engaged in regular out-of-school organised activities. And finally, it seemed likely that more of the children from council houses would fall in the lower attainment bands at school.

Environmental Knowing

One of the hypotheses to be tested here was that the two independent measures of knowledge of the town, the numbers of roads indicated on maps and the numbers of roads in the free recall lists, would be correlated. Also it was postulated that each of these measures would yield similar patterns of environmental knowledge in relation to sex and socio-economic group differences among the children. In general it was expected that boys would display more extensive knowledge of the town than girls, and also that children from private housing would show more extensive knowledge of the town than those from council housing.

Again from the trends at Croftlands School it was expected that children from the higher attainment bands would show more extensive as well as more detailed knowledge of the town (ie more roads as well as more named roads on their maps, and more roads in their lists), than children in the lower bands.

It was also expected that the junior school attended by the child would have influenced his knowledge of the town, so it was postulated that the children from the different junior schools would show characteristically different knowledge of the town.

Further hypotheses were that the knowledge of the town held by children who lived outside the town and had attended junior schools outside the town, would be restricted by comparison with the knowledge of children living in the town, and would be organised differently, centring on the school, and transport routes.

Finally it was postulated that there would be clear developmental trends amongst the Croftlands children, demonstrated by the maps drawn in successive years, and tending towards a more extensive knowledge, particularly of the older part of the town, with better integration and organisation of the additional areas, by means of greater map sophistication.

METHOD

All the children in one first year at the Victoria High School (Lower School) were included. There were 11 forms, three A, one A/B, four B and three C forms. Their separation into ability bands was the only measure of general school attainment. The A/B form was mostly those A children who had a slightly poorer mathematical ability.

The children's ages, names, home addresses and junior schools were obtained from the admission register for the school.

Information about type of housing and Gross Rateable Value, within Ulverston, was obtained from the local rating office.

The study was carried out during the last two weeks of the Summer Term 1978, after the examinations were over. By comparison with the atmosphere in the Junior School, the Lower School was much more formal and more noisy. The periods seemed short, since on two days there were special morning assemblies, and some children were involved in special activities and missed all or part of a lesson. The children worked well, and individual questionnaire replies displayed humour, but the whole exercise lacked the obvious enjoyment shown by the children in the Junior School where the novelty of the situation and the relatively unrestricted time enhanced the working conditions.

The questionnaires were completed by each child, in following weeks. These included questions on mode of transport, to school and to relatives, attendance at out of school activities, and preference for their junior school, the Lower School and swimming. (see Appendix III)

In one week a map of Ulverston was drawn. This included set reference points; the child's home, junior school, the Lower School, the Swimming Baths and the Hoad Monument. Those who lived outside Ulverston were asked to draw a map of Ulverston as far as they knew it.

In the other week a list of roads in Ulverston was asked for, the children were instructed that they must know and be able to imagine each road they named. For two A groups, two B groups and the three C groups this was a free recall exercise, but for the other groups they were asked to list the roads in alphabetical categories according to the initial letter of the name.

These two exercises were carried out in different weeks in order to minimise their influence on each other.

RESULTS

Behavioural Patterns

a) Sex Differences

The data from the questionnaires were analysed to test for differences in behaviour patterns due to the sex of the children.

As an indication of the extent of parental control over the movement of children around the town, the children were asked to show, on a five point scale, how often they told an adult where they were going. Separate questions were asked about going out after school and at the weekends. It was found that, after school, more girls than boys, more often told an adult where they were going; the χ^2 for the difference approached significance ($\chi^2_4 = 4.83$ $p > 0.05$ $N = 148$). At weekends the difference was clearly significant ($\chi^2_4 = 8.94$ $p < 0.01$ $N = 148$), with more girls telling an adult where they were going more often than boys. Presumably the greater concern at weekends was because the children would be out for longer periods, and there would be more people about. Telling an adult where you are going restricts movement, for you may feel obliged to go only where you have said you are going, and you take the risk that you will be forbidden to go to a particular place. If you don't say, generally you won't be forbidden.

Whereas in the preliminary study the majority of children walked to school because the journey was a short one; with just one secondary school in the town, the journey for some children would be longer, and this was especially so for the children from the Croftlands estate. Analysis of the numbers of boys and girls travelling to school on foot, by bus, bicycle and car, gave the following results.

Lower School

Sex	Mode of Transport				
	Walk	Bus	Bicycle	Car	Total
Boys	46	3	15	4	68
Girls	42	7	1	11	61
Total	88	10	16	15	129

Table 6.1 Mode of transport for the journey to school according to the sex of the child (N = 129) Lower School 1978

A test between the proportions shows significant differences ($\chi^2_3 = 16.98$ $p < 0.01$ $N = 129$) and inspection of the table suggests that whereas boys living at some distance from the school travelled by bicycle, girls went by car or bus. The proportion who walked was very similar for boys and girls.

However when the mode of transport for visits to relatives was analysed there were no significant differences between boys and girls ($\chi^2_3 = 2.09$ $p > 0.05$ $N = 92$), and the majority of both sexes went by car. This is probably because visiting relatives is often a family outing.

Analysis of participation in organised out of school activities by sex showed that significantly more girls than boys were involved ($\chi^2_1 = 4.84$ $p < 0.05$ $N = 128$).

Thus there are behavioural differences between the sexes, in relation to telling an adult when going out, where one was going; in mode of transport to school, and involvement with organised out of school activities.

b) Socio-economic differences

Breakdown of the mode of transport for the journey to school by socio economic group showed no significant differences, though proportionately more council house children walked than private house

dwellers. However, when the mode of transport for visiting relatives was analysed the differences between the two groups were highly significant ($\chi^2_3 = 16.49$ $p < 0.01$ $N = 92$), as the following table shows.

	Mode of Transport				
Type of housing	Walk	Bus	Bicycle	Car	Total
Private	14		6	45	65
Council	16	1	4	6	27
Total	30	1	10	51	92

Table 6.2 Numbers of children using the different modes of transport for visits to relatives, according to socio-economic group (N = 92) Lower School 1978

The majority of private house dwellers travelled by car, and the majority of council house dwellers walked. This could be due to council house dwellers having relatives also living in council property and therefore less widely dispersed than the privately housed group; in addition to less widespread car ownership.

Inspection of the proportion of council house and privately housed children by attainment band confirms the trend previously noted at Croftlands (p.81). The differences are significant ($\chi^2_2 = 10.14$ $p < 0.01$ $N = 102$) with more council house children in the lower band.

	Attainment Band			
Type of housing	A	B	C	Total
Private	30	25	16	71
Council	5	10	16	31
Total	35	35	32	102

Table 6.3 Distribution of numbers of children in the school attainment bands according to socio-economic group (N = 102) Lower School 1978

Attendance at organised out of school activities was expected to vary with the two groups[1] and from the results at Croftlands; but no significant difference was demonstrated. Inspection of the activities involved show that quite a number of these e.g. gymnastics, recorders, dance group, choir, Junior Military Band, cricket, football and rugby were organised by the school and took place on school premises; whereas at the Junior there were few activities organised by the school out of school hours.

c) Attainment

The predominance of privately housed children in the higher attainment bands has already been noted. When participation in organised out of school activities is considered this is also found to be associated with attainment, ($\chi^2_2 = 10.52$ $p < 0.01$ $N = 102$); as is number of activities engaged in, which increases in the higher attainment groups.

A breakdown of mode of transport to school by attainment band is highly suggestive of underlying socio-economic trends, though the figures do not yield a significant value of χ^2.

The table below is expressed as percentage of each band using the different modes of transport, and taken in consideration with the predominance of privately housed children in the higher bands; and the majority of council house children in the lower band, is quite revealing. Walking and bicycling increase from the A band down to the C band, travelling by bus and by car show the opposite trend.

School Attainment Band	%	Mode of transport: Walking	Bicycling	By Bus	By Car
Band A		51	4	34	11
Band B		57	13	24	7
Band C		63	15	22	0

Table 6.4 Percentage of children in each school attainment band who used the different modes of transport for the journey to school (N = 139)
Lower School 1978

Environmental knowing

a) Sex Differences

In the Croftlands studies (p. 85 & p.100) it was found that on average boys indicated more roads on their maps than girls did, suggesting a wider environmental knowledge. This result was also found in this study at the Lower School, with the mean number of roads on maps for boys of 24.4 (s.d. = 13.2, N = 78) and the mean numbers of roads on maps for girls of 20.8 (s.d. = 9.0, N = 70). Similarly the mean number of different roads listed in the free recall exercise, also showed a higher value for boys at 31.6 (s.d. = 15.5, N = 53) than for girls at 27.6 (s.d. = 11.1, N = 46). For both these results a non parametric median sign test was carried out for the significance of the differences between the means, and in each case the value of χ^2 was non significant i.e. there was no conclusive evidence that these groups came from statistically different populations.

The repetition of this result of a higher mean number of roads for boys than for girls, in each of the three studies (Croftlands 1976, Croftlands 1977 and Victoria High School 1978) is strong evidence for making the generalisation that boys know more roads than girls do: this is further confirmed by the independent measure of the higher mean numbers of the roads in the free recall lists for boys than for girls - though the median tests do not reach significance due to the large variances.

In the previous study some discussion was given to the fact that more girls than boys name more than half the roads they mark on their maps. This result was confirmed in this study too ($\chi^2_1 = 7.60$ $p < 0.01$ $N = 151$). Perhaps the girls compensate for their less wide ranging knowledge of the town by a more detailed observation. Since

the boys on average have more named roads in their lists it is not explained by the girls' preference for verbal schemata, but probably represents a better integration of information from the verbal and spatial schemata.

b) Socio-economic differences

As in the first preliminary study (page 87) a comparison of the mean numbers of roads indicated on their maps gives a higher value for children from private housing at 24.6 (s.d. = 11.9, N = 109) than those from council housing which was 17.5 (s.d. = 8.4, N = 39). In this case the median test was significant, $p < 0.05$. In the second Croftlands study (page 100) the opposite was found, though as noted, the sex ratio among the children would have influenced the result. Inspite of small numbers, this is more convincing evidence for the postulated difference. It could be that the influence of norms of behaviour over the whole estate, and reinforced by the school, lead to lesser differences between these groups than that which occurs over the town as a whole.

A similar relationship was demonstrated when the mean numbers of roads in free recall lists were compared. Children from private housing had a mean of 32.1 (s.d. = 13.9, N = 69) and from council housing a mean of 24.4 (s.d. = 11.9, N = 30). Though the median test failed to reach significance. Such differrences in environmental knowing may be due to both behavioural and cognitive differences, within the two groups.

c) Effect of Mode of Transport

Examination of the numbers of roads in free recall lists categorised by mode of transport is suggestive of real differences though the F test

just fails to establish significance. Further separation into attainment bands is very revealing; but an analysis of variance with a cross classification of mode of transport and attainment band is not appropriate because of the unequal numbers in the entries. However if the means for the numbers of roads for each of the different transport modes for the journey to school and for the attainment bands are calculated, the resulting table gives most suggestive evidence for both behavioural and cognitive differences.

	Mean number of roads in list		
Mode of transport	Band A	Band B	Band C
Bicycle	77.5	34.6	21.7
Walk	36.7	28.7	17.6
Car	36.6	35.0	
Bus	30.8	26.3	15.4

Table 6.5 Mean of numbers of roads in free recall lists, according to mode of transport for the journey to school, within each school attainment band (N = 139) Lower School 1978

In each band the mean number for those who bicycled is the highest and for those who went by bus, the lowest. The mean number of roads listed by the bicyclists of Band A is about five times the mean value for Band C children who went by bus; and for each mode of transport the mean for Band A is nearly twice the mean for Band C. This latter result suggests real cognitive differences whereas the mode of transport reflects the difference in opportunity for such environmental learning.

The difference between the mean numbers of roads for those who travelled to school by car and by bus may also reflect socio-economic differences, since the council house child is less likely to have the use of a car.

d) Participation in organised out of school activities

As with the Croftlands study (page 88) those children who participated in organised out of school activities had a higher mean number of roads on their maps, 22.25 (s.d. = 11.7, N = 77) than those who did not 19.68 (s.d. = 12.3, N = 22). The median test was non-significant.

e) Attainment

When the three attainment bands are considered, significant differences between numbers of roads indicated on maps were demonstrated by an analysis of variance ($F_{3,95} = 15.12$ $p < 0.01$ $N = 99$). Likewise there were significant differences due to attainment band in the numbers of roads listed in the free recall exercise ($F_{3,95} = 17.25$ $p < 0.01$ $N = 99$).

The mean number of roads indicated on maps for Band A was 28.9 (N = 35), Band B 20.0 (N = 31) and Band C 14.2 (N = 33). For free recall lists of roads the means were 39.8 (N = 35), 30.2 (N = 31) and 19.6 (N = 33). In general the lists comprised more roads than were put on maps.

This clear relationship between attainment and numbers of roads indicated on maps was not apparent in the previous studies at Croftlands, which included fewer children. With the larger sample from the Victoria High School in 1978 the overall variation is larger and there are three attainment bands instead of the five attainment groups used at Croftlands, so that differences are more clearly demonstrated.

The earlier result (Croftlands 1977) that the number of named roads on maps was clearly related to attainment band is also confirmed

by these results ($F_{2,145} = 17.28$ $p < 0.01$ $N = 148$). But an examination of the following table

	Mean No. of roads	Mean No. of named roads	Ratio of means
Band A	29.86	12.87	0.43
Band B	20.26	7.96	0.39
Banc C	14.15	4.19	0.30

Table 6.6 Mean numbers of roads indicated on maps, and mean numbers of roads named on maps, within attainment band. Ratio of mean number of named roads to mean number of roads indicated for each attainment band (N = 148) Lower School 1978

also shows that there is a trend towards a greater proportion of roads being named in the higher attainment groups; which indicates a greater integration of street names and their locations - i.e. of information from the verbal and spatial schemata.

Comparison of measures of environmental knowledge

So far various results have been given in terms of mean numbers of roads on maps or of roads in lists. These two measures were obtained from the children on different occasions and are statistically independent; and psychologically represent information from two different schemata.

The fact that certain relationships hold between the results based on information from one, or from the other schema, in relation to sex, socio-economic group and attainment, is taken as justification for making the generalisations that boys generally know more roads than girls; that the privately housed children generally know more roads than those from council houses and that the children in the higher bands at school generally know more than those in the lower bands.

Clearly the two measures involve very different processes, and individuals vary in their abilities in respect of verbal and spatial memory. Illustrations of such individual variability are given later, in Chapter VII.

Even given the memory for spatial relationships there remains the problem of transfering this to paper; in many ways making a list of roads was found to be an easier exercise than drawing a map. Few children of this age are content to draw fragmented maps, and it is likely that their knowledge extended beyond what they drew but they were unable to incorporate it to their drawing: on the other hand a list, though set down, necessarily, in some order, does not of itself demand an order; and, as will be seen later, often was composed of fragmentary portions linked sometimes by geographical and sometimes by verbal associations.

Consideration of the children who lived outside Ulverston, as well as those living within the town, gives some interesting results.

As mentioned earlier both these measures of environmental knowledge are linked with behavioural and cognitive differences between groups of children; it is therefore of interest to examine their correlation, for four groups of children.

Lower School

Numbers of roads

Groups	Correlation coefficient lists & maps r.	n.	p.	Mean, of lists	Mean, of maps
Children who lived in Ulverston and had attended Ulverston Junior Schools	0.68	99	0.01	30.2	21.7
Children who lived in Ulverston and had attended Junior Schools out of Ulverston	0.015	6	n.s.	24.3	14.2
Children who lived outside and attended Junior Schools in Ulverston	0.70	8	.0.05	26.9	19.6
Children who lived outside and had attended Junior Schools outside Ulverston	0.10	21	n.s.	17.5	16.5

Table 6.7 Correlation coefficients for the numbers of roads in lists and on maps of four different groups of children: 1) those who lived in Ulverston and had attended Ulverston Junior Schools 2) those who lived in Ulverston and had attended Junior Schools out of Ulverston 3) those who lived outside Ulverston and had attended Junior Schools in Ulverston and 4) those who lived out of Ulverston and had attended Junior Schools out of Ulverston. Mean numbers of roads in lists and on maps for the same four groups of children (N = 134)
Lower School 1978

The value of the correlation coefficient (r) is significant, for the largest group, who lived in Ulverston and had attended junior schools in Ulverston. Also significant is the correlation coefficient for those who lived outside but had attended junior schools in Ulverston. It is probable that these children made friends at school and centred their activities there, and the choice of a town school also suggests the family looked toward the town; these numbers are small, and may have also included children whose families had moved

out of town while keeping their children at school within the town. In general their maps are slightly less extensive than the first group, and their road lists are shorter. The correlation coefficients for the other two groups are small and non-significant. Examination of the group who lived in, but who had gone to school outside Ulverston shows that of these, four went to school away from the town, three at Barrow and one at Penrith, which suggests they have recently moved to the town; two went to country schools and they may also have recently moved. The relatively high number of roads on their lists suggests that the verbal schema may be learned more quickly, and through communication, rather than by movement through the environment.

The low correlation for the sample of those who lived outside Ulverston and who attended a country junior school may be further evidence that these schema are acquired independently and information becomes integrated as environmental learning takes place, since this group presumably had the least opportunity for learning about the town.

Paivio[2] discusses coding in memory in terms of both imaginal and verbal processes and postulates the independence of the codes, either of which may be available and activated in varying degrees.

Looking at the ratios of mean number of named roads on maps, to mean number of roads indicated, by each of the groups, again supports the superior knowledge and integration of knowledge of the two groups of children who had attended junior school in Ulverston, as the following table shows. It should be noted that this measure derived solely from the maps is quite independent of the correlation coefficient derived from both maps and free recall lists, yet this result also links the groups by junior schooling in Ulverston, rather

than by residence. It seems to emphasise perhaps the time taken to build up these schemata in a child's mind; but the numbers are small and conclusions speculative.

Group			n	From maps: Mean no. of roads	From maps: Mean no. of named roads	From maps: Ratio of means
Lived In	Junior School	In	99	21.6	9.3	0.43
Lived In	"	Out	6	14.2	3.8	0.27
Lived Out	"	In	8	19.6	8.3	0.42
Lived Out	"	Out	21	16.5	3.2	0.19

Table 6.8 Mean numbers of roads on maps, and mean number of named roads on maps, and their ratio, for four groups of children: 1) those who lived and had attended Junior Schools in Ulverston 2) those who lived in Ulverston but had attended Junior Schools outside Ulverston 3) those who lived outside but had attended Junior Schools in Ulverston and 4) those who lived out of Ulverston and had attended Junior Schools out of Ulverston (N = 134)
Lower School 1978

Environmental Knowledge and Junior Schools

To what extent do the children at the Victoria High School have different views of Ulverston according to the junior school they attended ? And what common view of Ulverston is shared by these twelve year olds ?

Because there is some choice of junior school the children do not all attend their local school; for each has a special character. Lightburn and Dale Street are each single sex schools in the older part of the town, St. Marys is a mixed Roman Catholic School, and Croftlands, the largest, is a mixed county school with a progressive image, on the more prosperous Croftlands estate.

Lower School

The characteristics of the 1977 intake to the Victoria High School from these schools is outlined below:-

Junior School	Type	Sex		Housing		% Council	Distance of Junior School from Lower School
		Boys	Girls	Private	Council		
Croftlands	Mixed	29	26	46	9	20%	1.25 miles
Lightburn	Boys	40	-	27	13	48%	0.36 "
Dale Street	Girls	-	38	25	13	52%	0.32 "
St Marys	Mixed R.C.	11	6	12	5	42%	0.60 "

Table 6.9 Some characteristics of the 1977 intake of pupils to the Victoria High School, Lower School, from the four Ulverston Junior Schools (N = 150)

As with the earlier data the two measures of the extent of environmental knowledge, numbers of roads indicated on maps and numbers of roads in free recall lists, yield similar patterns among the intakes from the different junior schools.

Junior School	n	Mean number of roads in lists	Mean number of roads on maps
Croftlands	39	34.56	25.03
Lightburn	26	30.15	20.12
St Marys	12	28.75	20.08
Dale Street	27	25.11	17.89

Table 6.10 Mean numbers of roads in lists, and on maps, of the 1977 intake of children from the four Ulverston Junior Schools, to the Victoria High School, Lower School (N = 104)

The highest values are at Croftlands, perhaps reflecting the generally higher socio-economic grouping and also the fact that it is the furthest from the lower School; so that the children are familiar not only with the Croftlands estate but also with the area between there and the Lower School at the far side of town.

Lightburn as a boys school could be expected to have the highest mean values but in fact comes next after Croftlands. St Marys as a denominational school has the largest catchment area of the four and comes almost equal with Lightburn. Dale Street an all girls school would be expected to show the most restricted maps and lists, as it does; it is also the nearest of the four junior schools to the Lower School.

To form a qualitative comparison it was decided to delineate on a street plan those roads listed by over half of the children, and by between a quarter and a half of the children, from each of the schools, see Fig. 6.1.

The map from the Croftlands intake is concentrated into two parts, on the estate and in the town. The dark line shows the large area known to half its members and the hatched line by between a quarter and a half. By contrast the area known by half the intake from Dale Street School has a very few roads immediately near the school, Hart Street by the Lower School and just two at the town centre, King Street and Market Street. Most of the roads known by a quarter of the Dale Street intake, are in the town, with just four on the Croftlands estate. The intakes from St Mary's School and Lightburn School have similar maps and both show roads in the town as well as roads on the Croftlands estate.

These maps show the real differences between the shared knowledge of the children from each of the four junior schools; all of whom now attend the Lower School. The maps suggest both quantitative and qualitative differences between their shared views.

The drawback to this method* is that it is dependent on the sample

*The decision to use the roads named by over half the children, and by between one quarter and one half of the children, is quite an arbitrary one. Those roads named by a third of the children could as easily have been chosen to display the material: but it seems that these proportions reveal both the likenesses and differences between different groups of childrens' views of the town.

Fig. 6.1 Street plans showing the location of the streets listed by the 1977 intake to the Lower School from each of the four Ulverston junior schools, Lower School 1978.

a) Croftlands School
b) Dale Street School
c) Lightburn School
d) St. Marys School

The thick line marks those streets listed by one half and more of the children in each group.

The hatched line marks those streets listed by between one quarter and one half of the children in each group.

JS - marks the position of the appropriate junior school on each map.

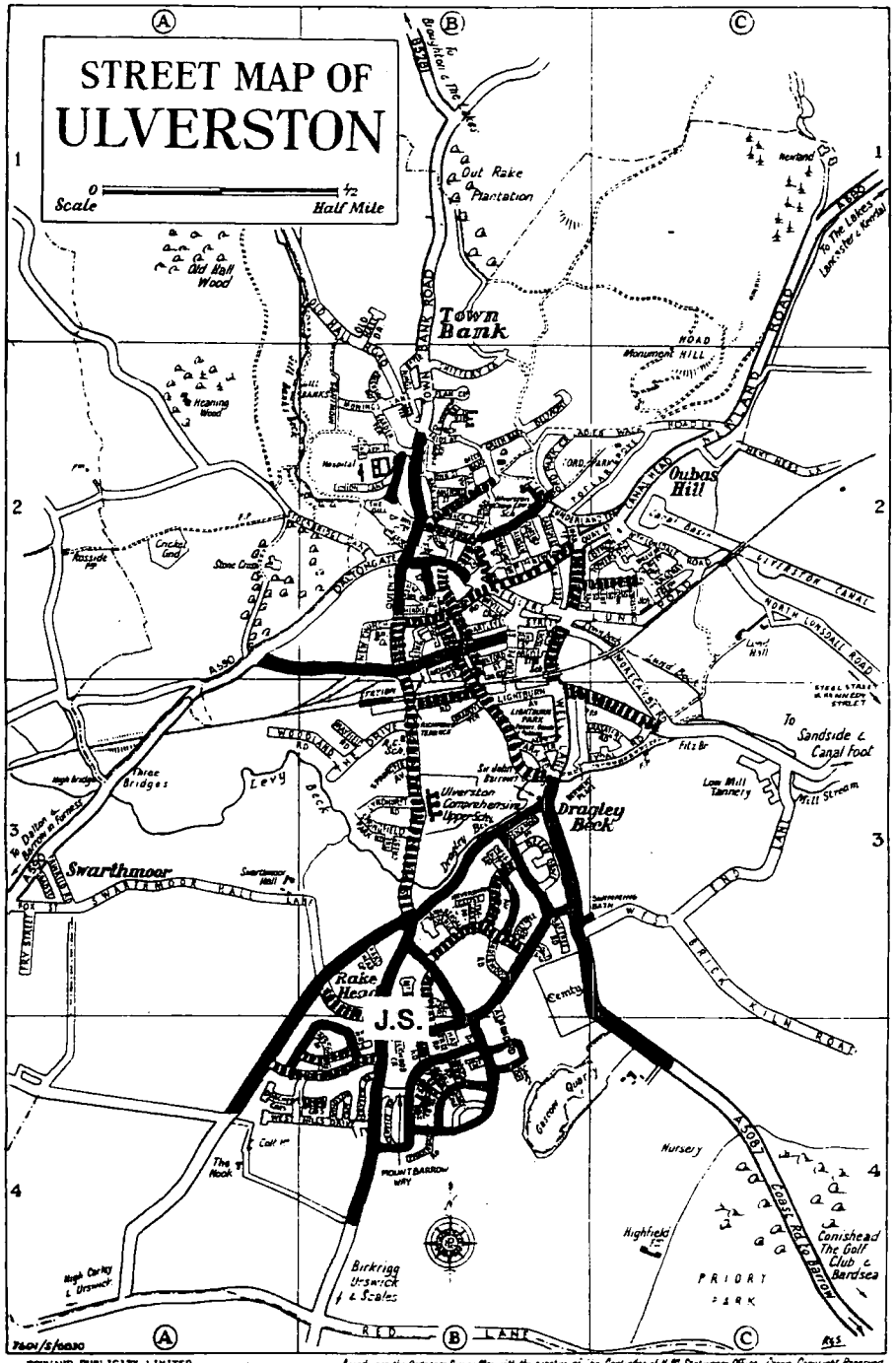


Fig. 6.1a

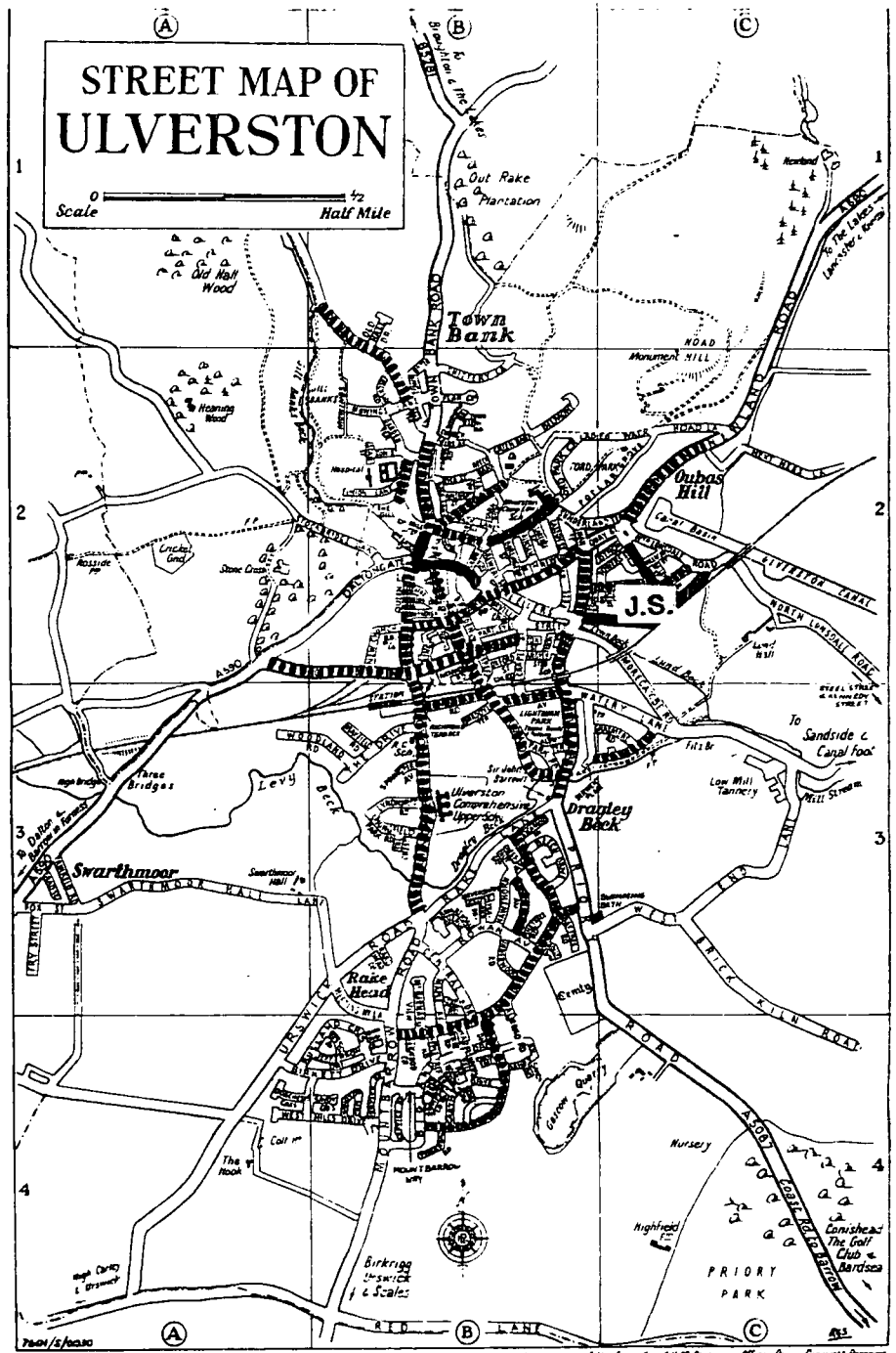


Fig. 6.1b

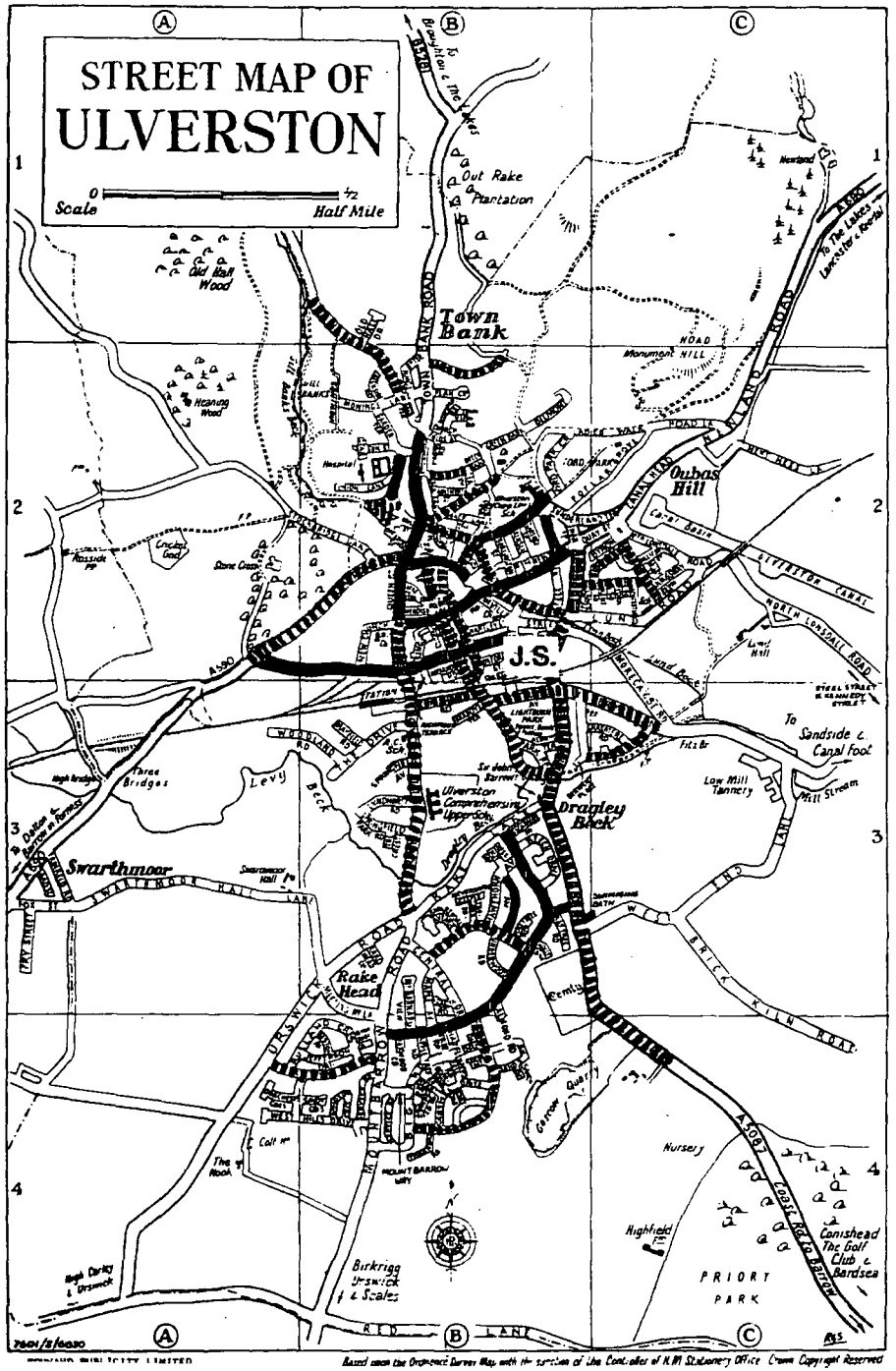


Fig. 6.1c

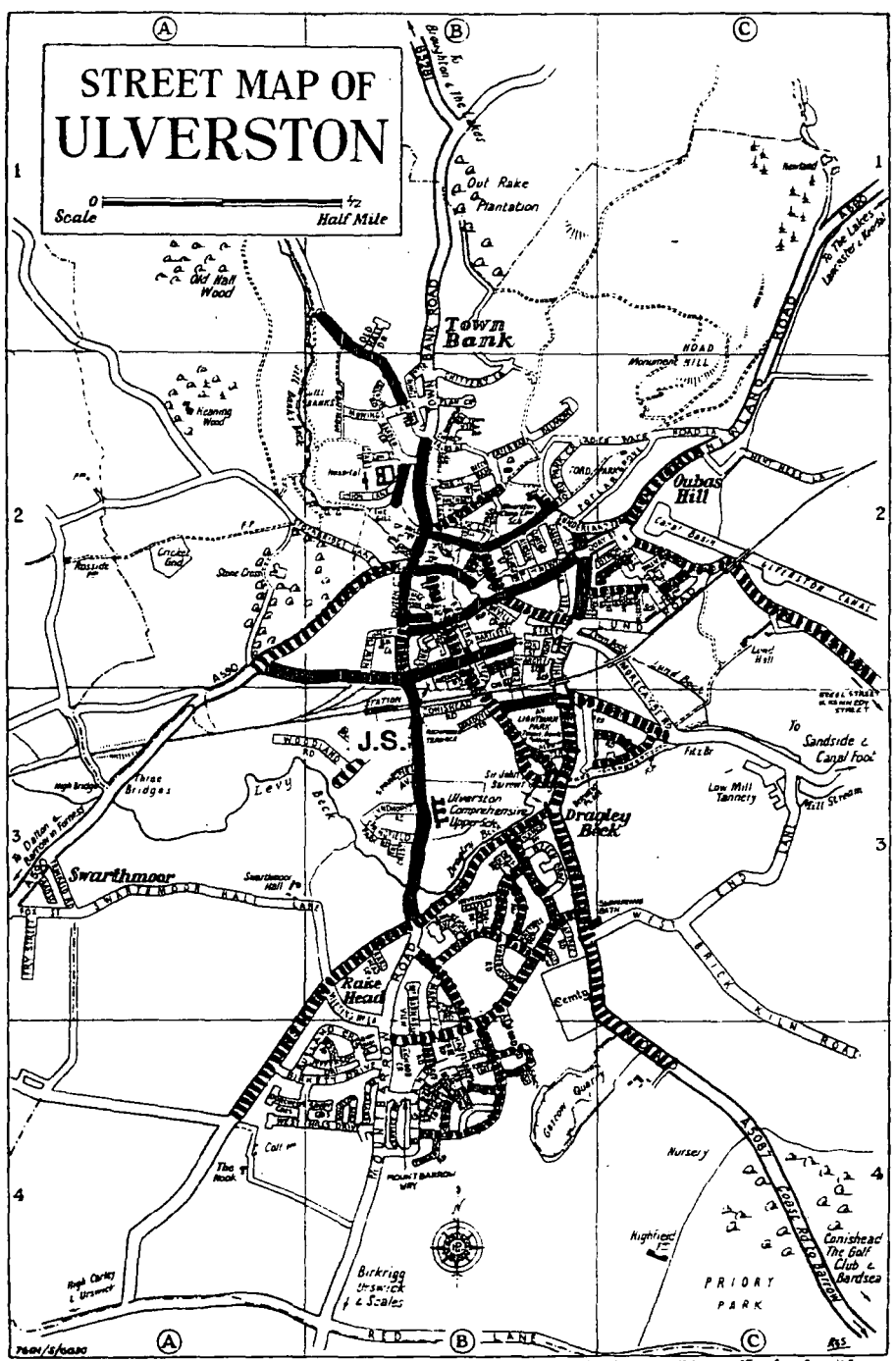


Fig. 6.1d

size, so that the results demonstrated are not strictly comparable, but are illustrative. Taking it to extremes, the 'overlap' between two lists is likely to be more for two lists, than the 'overlap' between ten separate lists; add to this the complication of the differing length of lists and it becomes clear that there is no simple formulation for the relation with sample size in terms of chance. Clearly the lists of children living closer together and with similar movement patterns are going to coincide more closely than those living in different parts of the town and with few common venues in their movement patterns.

If the total number of different roads listed by the intake from one junior school is divided by the number of children contributing, this gives an average number of different roads per child; this is a measure of the uniqueness of lists and contrasts with the number of roads listed by over half the children from the school, which is a measure of consensus.

A table for the intakes from the four schools is given below.

Junior School	n	Number of roads listed by over half the intake	Total different roads listed	Average number of different roads per child
Croftlands	39	21	154	3.95
Lightburn	26	13	146	5.62
St Marys	12	14	113	9.42
Dale Street	27	5	132	4.89

Table 6.11 Comparison of characteristics of the lists of roads from the 1977 intake from each of the four Ulverston Junior Schools. (N = 104)

Ranking the schools according to the extent of the shared maps gives a similar order to that for the mean number of roads per child marked on the maps, with Croftlands School showing the most and Dale Street School the least.

Lower School

The large idiosyncrasy measure, of different roads per child, for St Marys was to be expected given its wide catchment area. Croftlands, with its high consensus view, has a correspondingly small idiosyncratic measure. Lightburn has a higher idiosyncratic measure which might be expected from the wider general knowledge of boys, and only moderate consensus measure.

It is however inappropriate to make strict comparisons of these idiosyncrasy measures for they depend on sample size. As the number of children in a sample increases so the number of different roads listed may be expected to increase until it reaches the maximum, i.e. the total number of roads in the town.

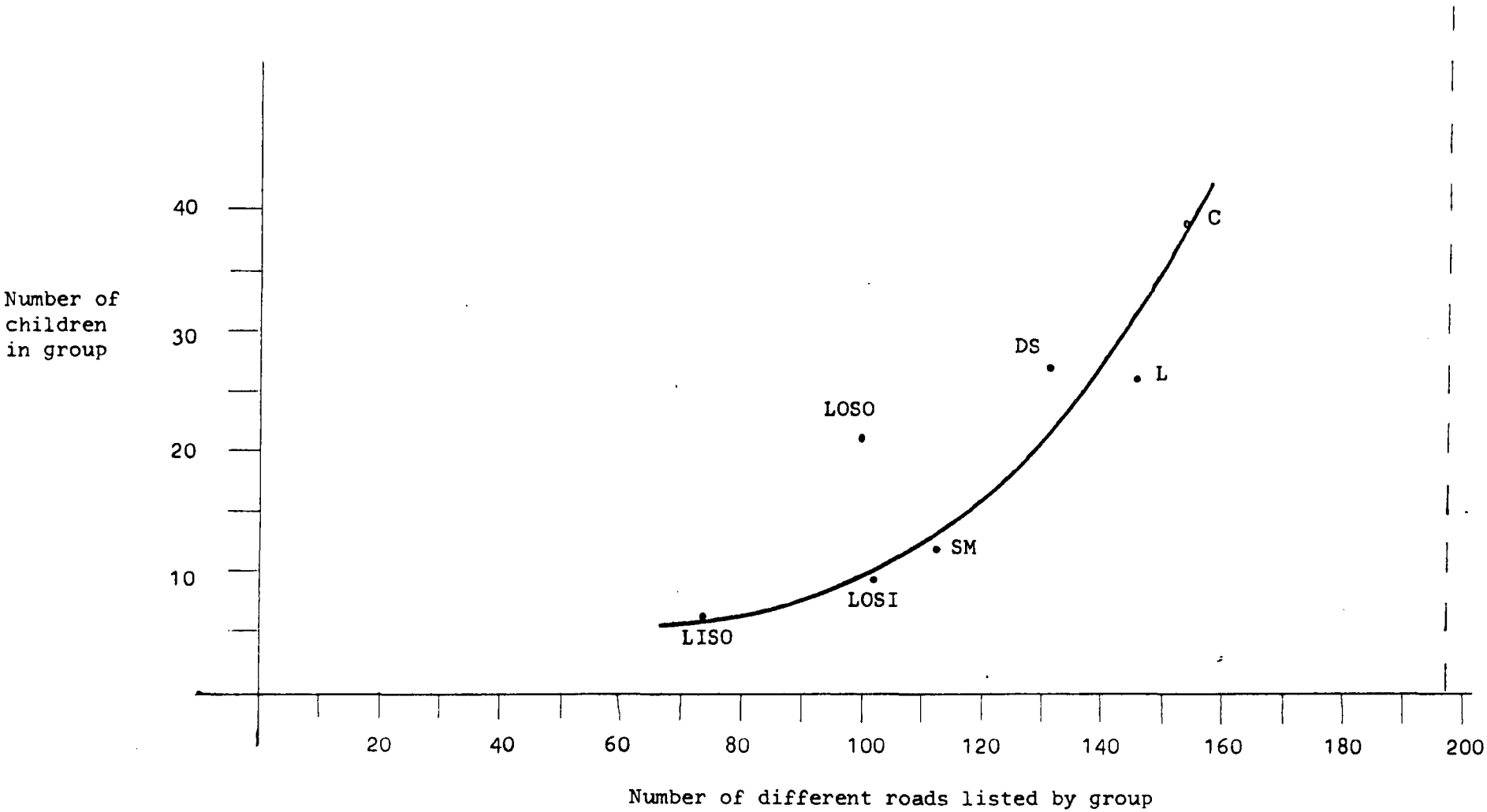
If the number of children in the group is plotted against total different roads listed these are seen to fall near a curve rising to an asymptote at 198 - the number of streets in Ulverston. Clearly the Dale Street point comprises too few roads and the Lightburn point too many by comparison with the points of the mixed groups and this is further evidence for the different environmental knowledge of boys and girls, see Fig. 6.2.

It is also possible to include on the graph the three points for the other groups of children. The points for both those who live in Ulverston and attended schools outside (LISO), and for those who lived outside Ulverston and attended schools in the town (LOSI), seem to lie near the hypothetical curve. However, the point for those living outside Ulverston and who attended junior schools outside Ulverston (LOSO) shows too few roads and demonstrates the different character of the environmental knowledge of that subsample.

It would be interesting to compare these results with those from children higher up in the Victoria High School to see how long the

Fig. 6.2 Scattergram of the number of roads listed by different groups of children, Lower School 1978.

LISO - children who lived in Ulverston and attended junior school out of Ulverston
LOSI - children who lived out of Ulverston and attended junior school in Ulverston
LOSO - children who lived out of Ulverston and attended junior school out of Ulverston
SM - children who attended St. Marys School
DS - children who attended Dale Street School
L - children who attended Lightburn School
C - children who attended Croftlands School


Number of children in group
40
30
20
10
C
DS
L
LOSO
SM
LOSI
LISO
20
40
60
80
100
120
140
160
180
200
Number of different roads listed by group

influence of the junior school attended affects the view of the town as displayed in lists of road names.

Maps and Lists

So far quantitative comparisons of information from maps and lists has been considered, with little attention to the qualitative aspects.

Drawing a map requires the structuring of information and a knowledge of spatial relationships. The drawing may itself act as a cue to further drawing, and some parts of the map may be completed because the arrangement fits logical requirements, rather than because the arrangements were remembered in detail. There are also expectations about how a map should appear, and it was clear that the children at the Lower School were reluctant to draw fragmented maps.

Lists tap a verbal memory store, and there are no expectations about the order or appearance of a free recall list, though one item may act as a cue to the next. Some lists showed groups of names which showed a verbal linkage as well as a geographical one, for King Street, Queen Street, and Princes Street run on from one another. One child added Duke Street and there is no longer a Duke Street in Ulverston, though there is an important shopping street in Barrow of that name. Star Street and Sun Street are contiguous, and if either is mentioned the other is usually listed also. New Market Street runs out of Market Street, the most frequently named road, and is very frequently listed after it. Soutergate and Daltongate are quite often listed successively and this is clearly a verbal link since they are separated by Queen Street. Likewise Appletree Road and Cherrytree Road are often listed next to each other though they are separated by Oakwood Avenue

and part of Rowan Avenue. Other associations in the lists are clearly geographical and some children appear to start their lists as though tracing an imaginary route through the town, but later add geographically fragmented sections.

In both maps and lists there may be elements of unconcious affective processes at work. In the case of a map these may be evidenced by distortions of scale[3] and within a list by aspects of order.

Views of Ulverston - town and country

The first named road on the lists of road names may give some indications of how the child views the town, and these are given below.

Street	No. of children
Home street	68
Street in home neighbourhood	12
Town centre (King St, Queen St, & Market St)	3
Country road	4
Hart Street (site of Lower School)	7
Others (mostly residential)	13
total	102

Table 6.12 First named streets in Ulverston from the lists of the 1977 intake to the Lower School: children who had lived and been to junior school in Ulverston. (N = 102)

These figures suggest that over half the children were still home centred in their view of the town. It could be argued that a developmental trend towards greater objectivity about the town would suggest the following progression from 1) home street to 2) main street in home neighbourhood to 3) a street in the town centre and finally 4) the county road or A590, on which Ulverston lies.

It would be interesting to examine such first named roads over all the classes in the Lower School, and with adults, including groups who perhaps travel for work; to test this hypothesised developmental pattern.

Further analysis showed there was no significant difference in the proportions of girls and boys listing the home street first, nor between the children from private and council housing.

Inspection of the first named roads on the lists of children living out of Ulverston shows that for many country children, their view of the town centres on the school, for nearly a third listed Hart Street first. However shopping streets came next accounting for nearly a quarter of the first named streets (compared with 3 in 102 for the town children). The remainder were either one of the arteries into town or were dispersed residential streets, both in the older part of the town and on the Croftlands estate; presumably these were locations of houses of relatives and friends.

Street	No. of children
Hart Street (site of Lower School)	9
Town centre (King St, Queen St, & Market St)	5
Other shopping streets	4
Arteries to town	3
Residential streets in town	10
Residential streets on Croftlands	3
	34

Table 6.13 First named streets in the free recall lists of the 1977 intake to Lower School: children who lived out of Ulverston and had attended junior schools out of Ulverston (N = 34)

Following the method employed earlier for the groups of children who had attended the four junior schools; the listed roads named by one half and over, and between one quarter and one half, of the children in the two groups have been marked on maps, see Fig. 6.3.

Fig. 6.3 Street plans showing the location of the streets listed by the 'town' children and the 'country' children, Lower School 1978.

a) Group map of children living outside Ulverston and who had attended junior schools out of Ulverston
b) Group map of children living in Ulverston and who had attended junior schools in Ulverston

Those streets listed by one half and over of those children in the group are marked with a dark line.

Those streets listed by between one quarter and one half of the children in the group are marked with a hatched line.

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.3a

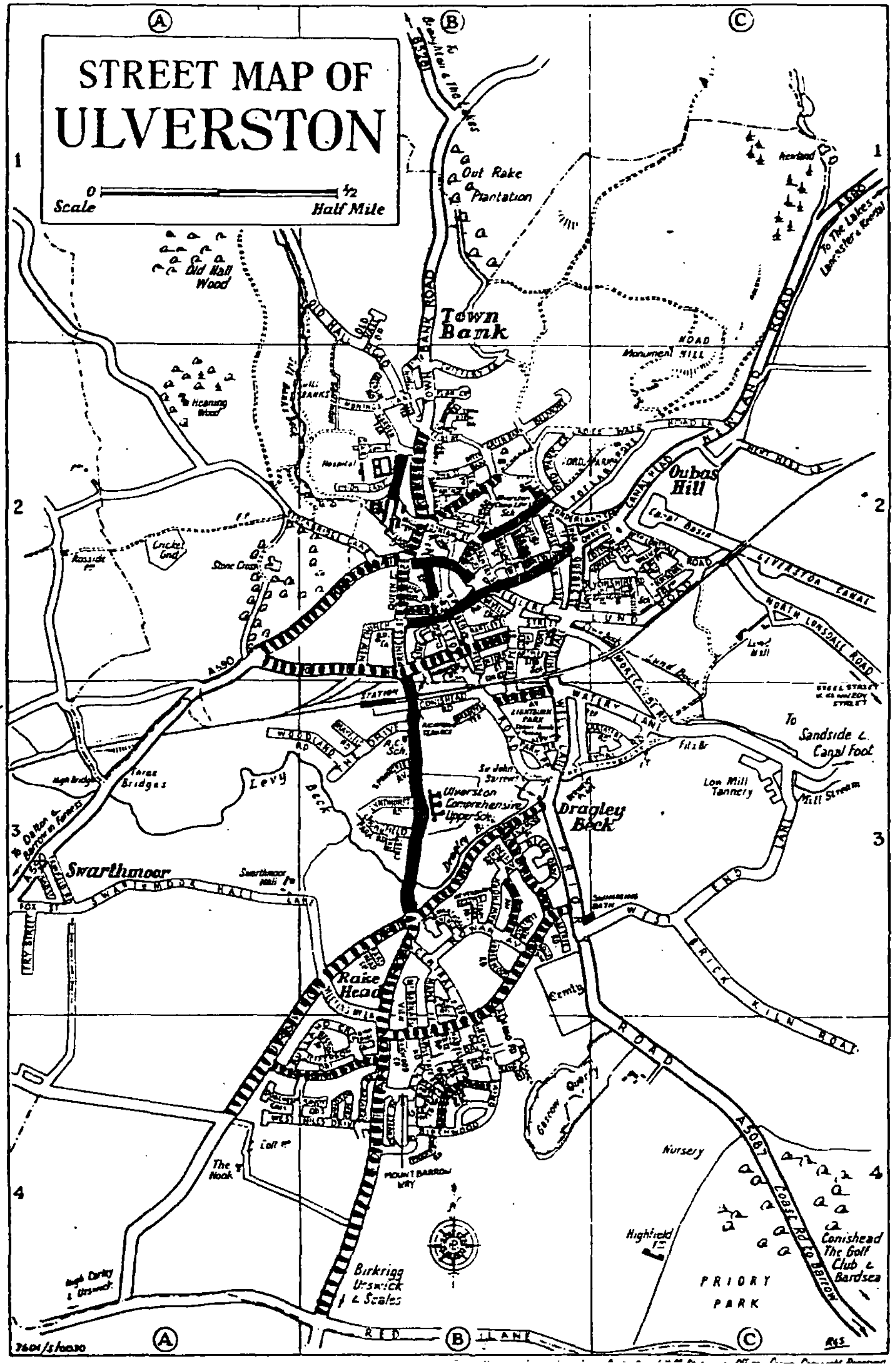
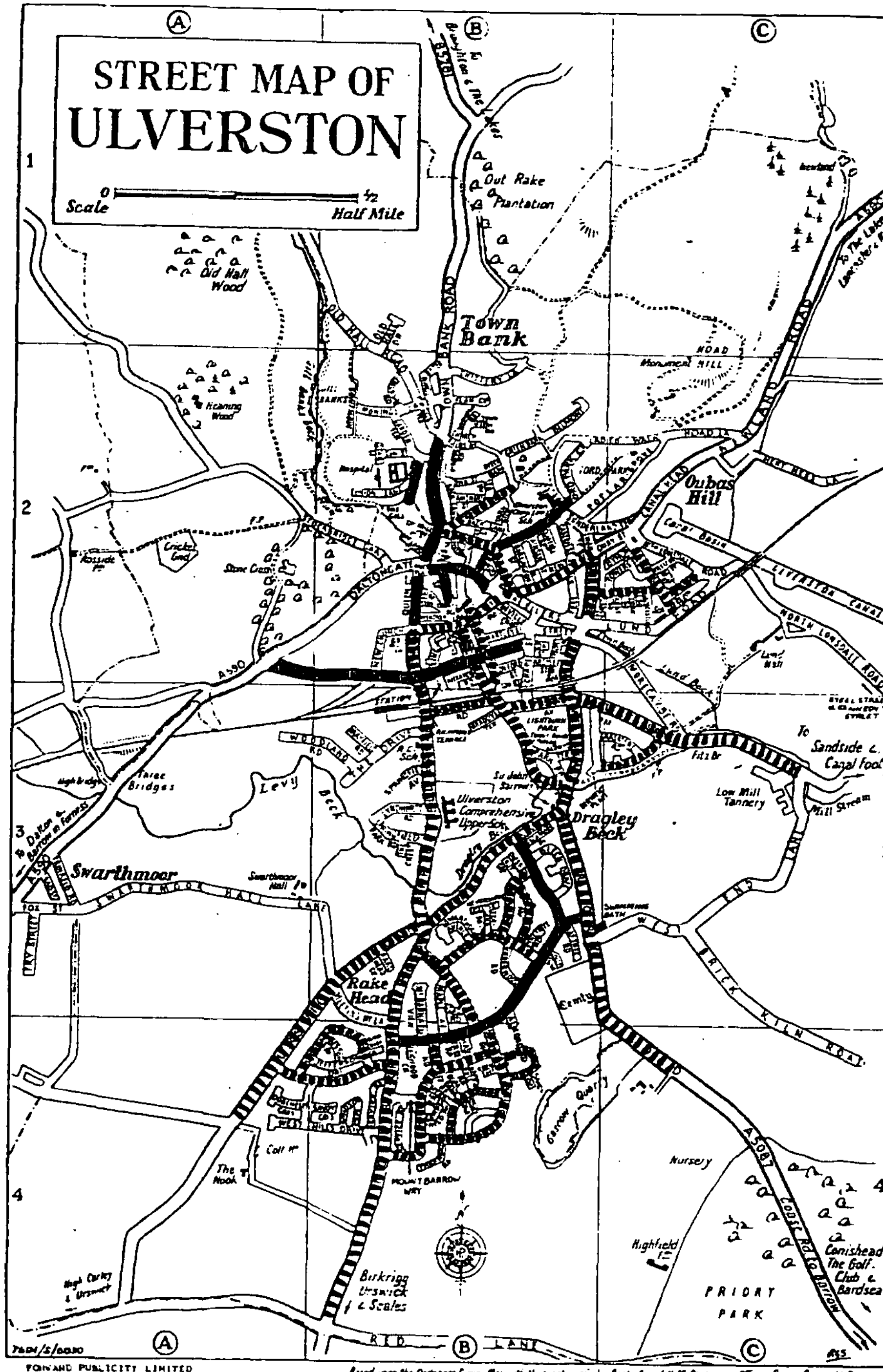

STREET MAP OF
ULVERSTON
Scale
Half Mile
Out Rake
Plantation
Old Hall
Wood
Town
Bank
Monument Hill
Oubas
Hill
Canal Basin
Ulverston Canal
North Lonsdale Road
To Sandside & Canal Foot
Three Bridges
Levy
Beck
Ulverston
Comprehensive
Upper Sch.
Dragley
Beck
Swarthmoor
Rake
Head
Garrow Quarry
Nursery
Highfield
Conishead
The Golf
Club &
Bardsea
PRIORY
PARK
Birkrigg
Urswick
& Scales
Low Mill
Tannery
Mill Stream
Red Lane
A590
A5087
Cemy
Heaning
Wood
Hospital
Station
Lightburn
Park
To The Lakes
Lancaster & Kendal
Colt Ho
The
Nook
Mount Barrow
To Dalton & Barrow in Furness
A
B
C
1
2
3
4

Fig.
6.3b


STREET MAP OF
ULVERSTON
Scale
Half Mile
Out Rake
Plantation
Old Hall
Wood
Town
Bank
Monument Hill
Oubas
Hill
Canal Basin
Ulverston Canal
North Lonsdale Road
To Sandside & Canal Foot
Three Bridges
Levy
Beck
Ulverston
Comprehensive
Upper Sch.
Dragley
Beck
Swarthmoor
Rake
Head
Garrow Quarry
Nursery
Highfield
Conishead
The Golf
Club &
Bardsea
PRIORY
PARK
Birkrigg
Urswick
& Scales
Low Mill
Tannery
Mill Stream
Red Lane
A590
A5087
Cemy
POINT AND PUBLICITY LIMITED
A
B
C
1
2
3
4

Lower School

It is immediately apparent that the view of the country children, those who live outside Ulverston and went to school outside Ulverston, is more restricted than that of the town children, those who live in Ulverston and went to junior school there, though for both groups the consensus view, roads named by one half and over of the children in the group, is quite small, showing the tendency to wide dispersion of experience and knowledge taken over the whole of each group.

The roads listed by over half the country children are:-

Hart Street	- where the Lower School is situated
Stanley Street	- where the hospital is situated
Springfield Road	- where the Upper School and St Marys Junior School are situated
County Road	- the main through road
Market Street)	- where the market and other shops
New Market Street)	- are situated in the town centre

Table 6.14 Roads listed by one half and over of the children in the group of the 1977 intake to the Lower School: children who lived outside Ulverston and had attended junior schools outside Ulverston. Free recall lists only (N = 34) Lower School 1978

The roads listed by over half the town children are slightly less predictable, though there is much common ground with the country children.

The roads listed by one half and over of the town children were:-

Hart Street	- where the Lower School is situated
Stanley Street	- where the hospital is situated
Market Street)	- where the market and other shops
New Market Street)	- are situated in the town centre
Queen Street	- where shops and municipal offices are situated
Soutergate	- older street with few shops, leading towards Broughton in Furness and the Lakes
Lightburn Road	- bus route, with R.C. Church, Bethany Hall and Cumbria Crystal works
Oakwood Drive	- through road, Croftlands estate, where Croftlands Junior and Infants Schools are situated
Limetree Road	- residential road, Croftlands estate, bus route

Table 6.15 Roads listed by one half and over of the children in the group of the 1977 intake to the Lower School: children who lived in Ulverston and had attended junior school there. Free recall lists only (N = 102) Lower School 1978

At the next level, those roads listed by over a quarter and up to one half of the children in the two groups, increases the overlap between the two maps, while emphasising the more extensive view held by the town children. Whereas on the town children's group map each of the four roads alongside the junior schools are marked, on the country children's map only two of these are present, i.e. Springfield Road, where St Marys Junior School is situated which also runs alongside the Upper School and is a main artery into town, and Oakwood Drive, where Croftlands Junior and Infants Schools are situated but which is also the chief road through the estate.

It is perhaps worth noting those roads omitted from the town children's group map, and included on the map of the country children.

The Gill	- an open 'square' with a few shops, public lavatories, and parking space near the hospital; it is also the site of a Sunday School building where Brownies and Scouts meet and badminton is played
Cavendish Street	- a shopping street in town, The Cavendishs are an important family in the district, landowners and aristocrats
Ainslie Street	- a residential street leading through towards the Lower School, from the county road; named after a local worthy

Table 6.16 Roads listed by over a quarter of the country children in the 1977 Lower School intake, and not listed by as many as a quarter of the town children. Lower School 1978

Perhaps this pattern is unique to this year group. It would be interesting to compare the road lists of successive year groups in the school, and those of particular groups of adults living in the town. The roads listed by over half the children in the group might be expected to be such key roads that they would very largely be included on similar group lists for all year groups.

The consensus measure was defined as the number of common roads listed by one half and more than one half of the children within a group. For the 'country' children there were 6 such roads whereas for the town children it was 9. The value for the Dale Street intake at 5, was even less than for the country group; whereas the values for the intakes for the other three junior schools exceeded that for the town as a whole. This shows the small overlap for children from different parts of the town, and outside it.

Examination of the full list of roads listed by over a quarter of the town children showed that a great many were bus routes. Perhaps these were 'pathways' in Kevin Lynch's[4] terminology and chosen for that reason as bus routes.

The author has mentioned the functional attributes of roads listed, and these seem to provide the most likely basis for inclusion, rather than their names or architectural features. Moore[5] remarks that 'architectural form features seem to relate very little with people's memory for buildings or urban landscapes, but rather that use, significance, siting, visibility, and ease of linguistic labelling are more important to memory.'

Some developmental considerations

The maps of the Croftlands children after they had been at the Lower School for a year showed a definite increase in extent, with the mean number of roads 21.5, s.d. = 10.5, N = 42 for this particular group in 1977 and a mean of 27.9, s.d. = 13.0, N = 42 in 1978. The clear increase reflects wider movement patterns, including presumably the regular journey to the Lower School. Although some maps were well organised, most showed little structural development compared with the previous year. The correlation coefficient between numbers of roads

marked on the maps for the two years was significant at 0.61 (N = 42). The correlation coefficient between the numbers of roads named on the maps was also significant at r = 0.56 with means of 10.2, s.d. = 5.7, N = 42 for 1977 and 12.21, s.d. = 10.28, N = 42 for 1978.

This seems to confirm that it is cognitive abilities which affect such memory, in that in general those who drew extensive maps in the first year also did so in the second. The larger variance in the second of the two years may represent the variability in the development that had taken place and include the variable effect on the children of the move to the secondary school. The ratio of mean number of named roads to mean number of roads indicated in fact decreased from 0.47 to 0.44 which does not correspond with the developmental trend, postulated earlier, toward greater integration between the two schemata. However with the very wide variability shown this difference may not be considered very noteworthy.

To examine the possibility of the operation of a distance decay function in relation to scale, with home as origin, the distances on the children's maps for 1978 from home to junior school and home to Lower School were measured. These were related to the ranking for the two distances home to junior school and home to swimming baths the previous year, 1977. A χ^2 test was non-significant, showing no consistency from one year to the next for the adoption of a decreasing or increasing scale ratio with increasing distance.

Visual judgements of the maps suggest that the additional information about the town displayed had in many cases not resulted in the formation of an integrated schema for the whole area. Following Lee[6] this could be due to the 'causeway schema'; or, following Moore[7] be the stage he describes as "differentiated and partially coordinated".

The positions of the Hoad Monument and of the Swimming Baths, though marked on the majority of the maps, showed these were not well known, and any measurements to them would be quite unrealistic. The maps presented a much more heterogeneous collection than those in the Croftlands study, and some discussion of the wide individual variation found in maps and lists is given in the next chapter.

SUMMARY

In this study the factors of sex, socio-economic group and attainment were related to environmental knowledge and in general confirmed the findings of the earlier studies. Mode of transport, and attendence at organised out of school activities also seem to affect the opportunities for environmental learning, though the latter did not show the same restricted social base as at the junior school.

The correlation between the numbers of roads in lists and on maps was significant and gives some validity to the use of either of the measures for the comparison of groups.

The characteristics of the 'group views' of Ulverston for the four intakes from the junior schools reflected their catchment area and the sex of the children.

The correlation between the numbers of roads, and the numbers of named roads on maps drawn by the same children in successive years, indicates some reliability of the measure over time; and probably relates more to cognitive abilities than to movement patterns, which will have changed considerably with the change to secondary school.

[1]Roberts, K. (1970) Leisure, London, Longman.

[2]Paivio, A. (1976) Imagery in Recall and Recognition, in Recognition and Recall, Brown, J., New York, John Wiley.

[3]Anderson, J. & Tindall, M. (1972) 'The concept of home-range: new data for the study of territorial behaviour', Environmental Design and Research Association, Conference Proceedings, No. 3, School of Architecture and Urban Planning, University of California, Los Angeles.

[4]Lynch, K. (1960) The Image of the City, Cambridge, Mass., Massechusetts Institute of Technology Press.

[5]Moore, G.T. (1979) 'Knowing about environmental knowing: the current state of theory and research on environmental cognition', Environment and Behaviour 11, 33-70.

[6]Lee, T. (1976) Psychology and the Environment, London, Methuen.

[7]Moore, G.T. (1974) 'The development of environmental knowing: an overview of an interactional-constructional theory and some data on within-individual development and variations', in Psychology and the Built Environment, eds. Canter, D. & Lee, T., Architectural Press.

CHAPTER VII

Individual Differences

So far, a quantitative approach has been adopted in order to describe the extent of environmental knowledge and to relate this to different groups of children. Such summarising of material by a few parameters conceals the wide individual variation, and in particular the qualitative aspect; in short, not how many but which roads are known?

As Downs & Stea[1] have emphasised, a sketch map cannot be tested for veridicality against a cartographic map. It is however instructive to see which roads a particular child has marked on his map, or included in his list of roads, and to mark these on a street plan of the town. This gives some comparison of the information described by the two different schemata and conveys more than a mere list of roads which does not display the spatial relationship of the list. Of course a great deal of highly relevant information is not revealed - whether the road is up or down hill, whether there are shops and so on; and it is these characteristics which often dictate the route taken and contribute to environmental learning.

Differences within individuals

In very few cases was it possible to identify all the roads drawn on a sketch map; but one example is given as an illustration (Fig. 7.1). It is printed alongside a street plan on which the roads have been marked and shows some of the characteristic distortions of sketch maps, and the prominence given to the roundabout: a feature that was often enlarged on the children's map. This map did not extend to the Croftlands estate. This child, Boy A, in form IA/B lived in the town

Fig. 7.1 Comparison of sketch map, and the location of the same roads on a street plan, by Boy A, Lower School 1978.

a) Sketch map by Boy A
b) Streets from the sketch map marked on the street plan, to show relationship with the location of his home, junior school and the Lower School.

H - Home
JS - Junior School
LS - Lower School

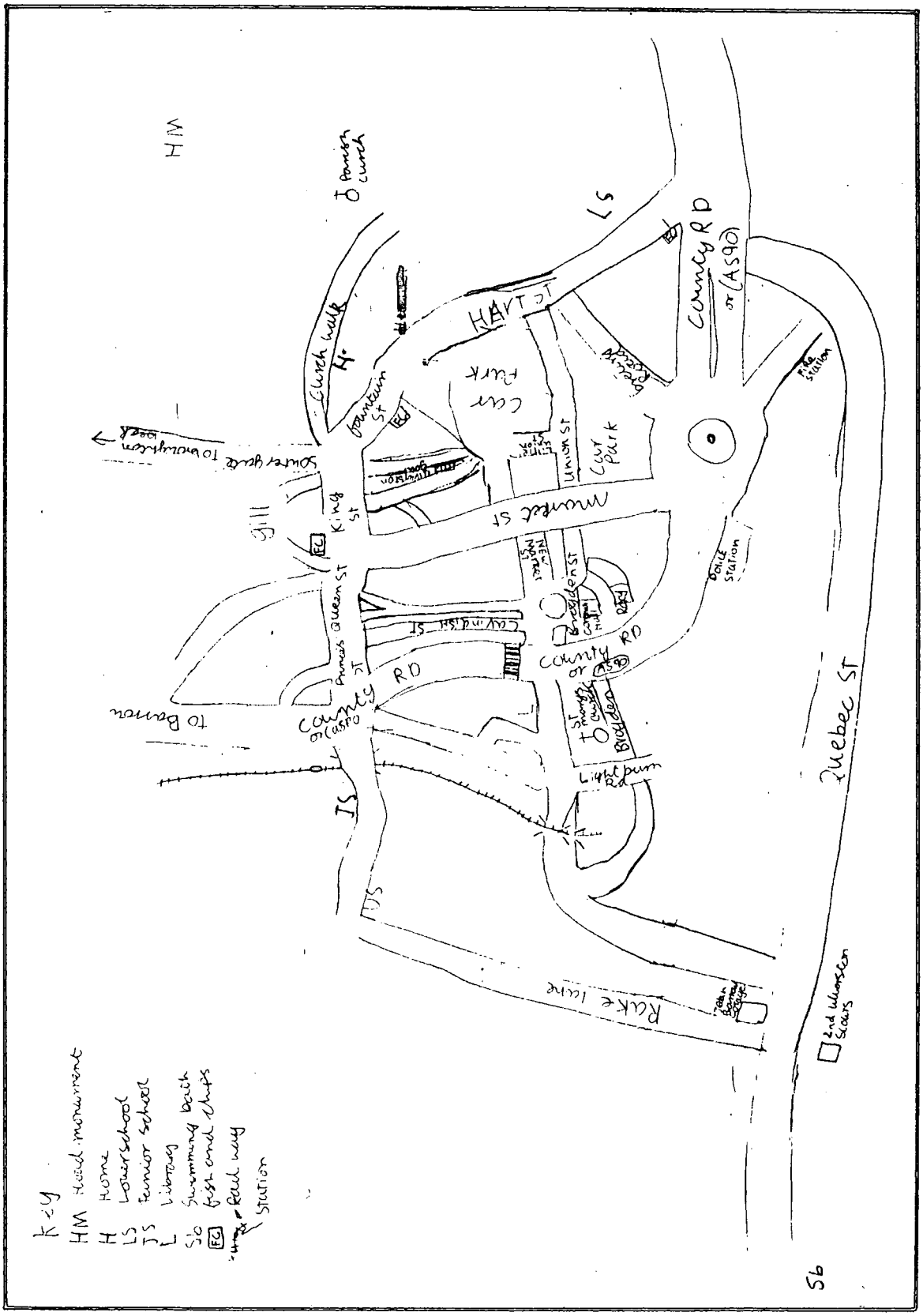


Fig. 7.1a. Boy A, 1978

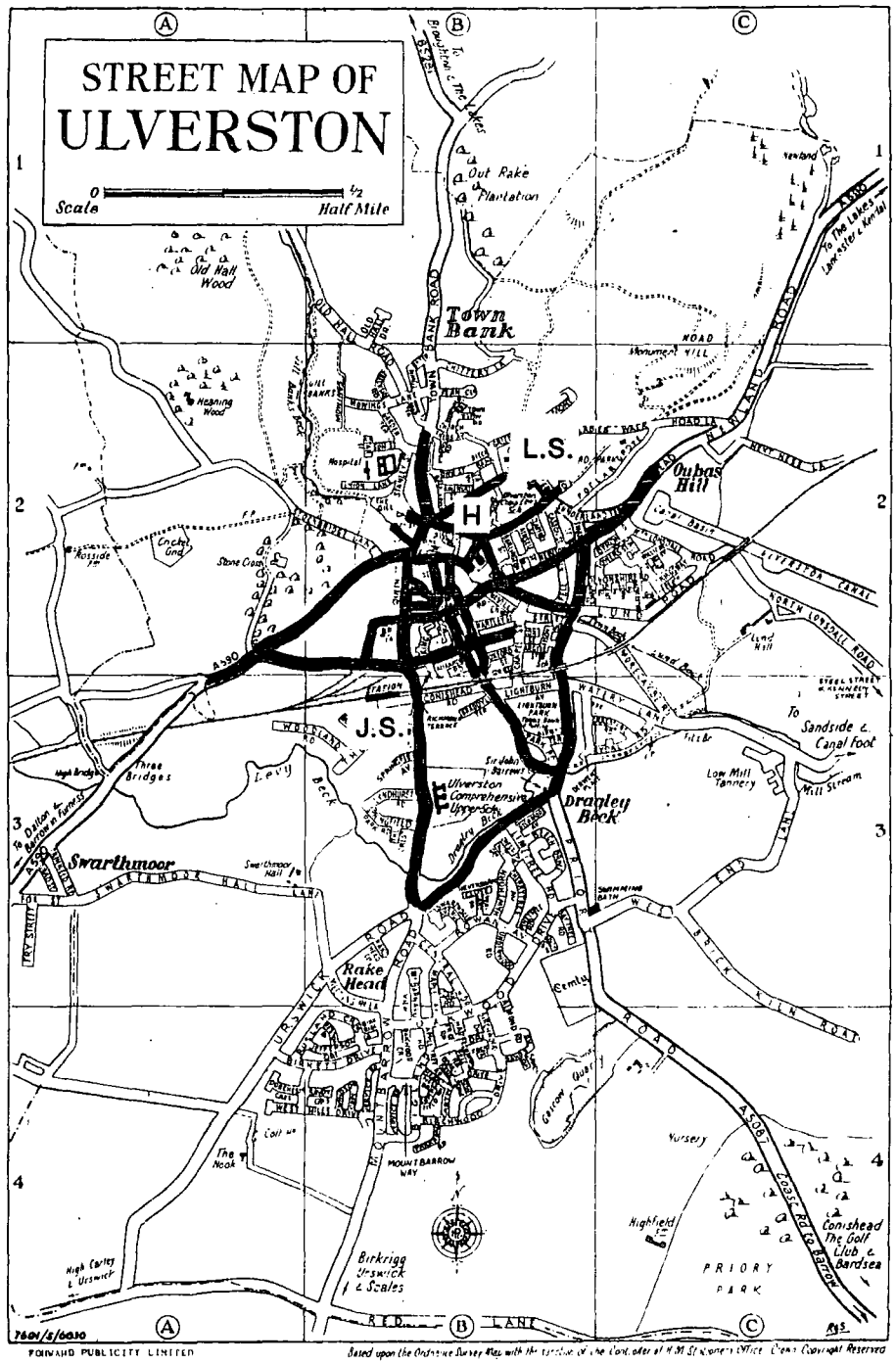


Fig. 7.1b. Boy A's mapped streets

and had attended St Marys Junior School before moving onto the Lower School. In Fig. 7.2 the same street plan is printed beside another on which all his listed roads are marked. Two roads on the Croftlands estate are included in the list, but are missing from his sketch map.

The unified nature of the knowledge displayed in map form is in sharp contrast to the fragmentary information from the list of roads. This comparison also demonstrates the general pattern, where the list of roads is more extensive than the map.

One exception to this general rule was the map of a Boy B in the A band, where more roads (33) were drawn than were listed (19). Among his out of school activities was "playing chess in tournaments in Cumbria"; so he probably had a particularly well developed spatial ability. Again, his map did not extend towards the Croftlands estate, although his list included two roads there. His map is shown alongside a street plan on which his listed roads have been marked (Fig. 7.3).

Girl C from the C band also displayed very fragmented knowledge by her list of roads, here marked on a street map; and yet had a well organised map (Fig. 7.4); and this stresses the different information incorporated in the two schemata. Her use of the conventional symbol for a church is a reflection of the effect of formal education. For these children had been introduced to the use of the ordnance survey map in geography lessons that year and many were clearly striving for the objective and impersonal qualities of a printed map.

Another aspect of within-individual differences is the development from one year to the next. Maps were available for the years 1977 and 1978 for the Croftlands School children and the Croftlands Intake to the Lower School. On these and later maps a triangle has been drawn joining the childs home, Junior School (Croftlands) and the swimming

Fig. 7.2 Comparison of the location of roads from Boy A's list and from his sketch map, Lower School 1978.

a) Street plan with roads from Boy A's list marked, to show the relationship with the location of his home, junior school and the Lower School

b) Street plan with roads from Boy A's sketch map marked, to show the relationship with the location of his home, junior school and the Lower School

H - Home
JS - Junior School
LS - Lower School

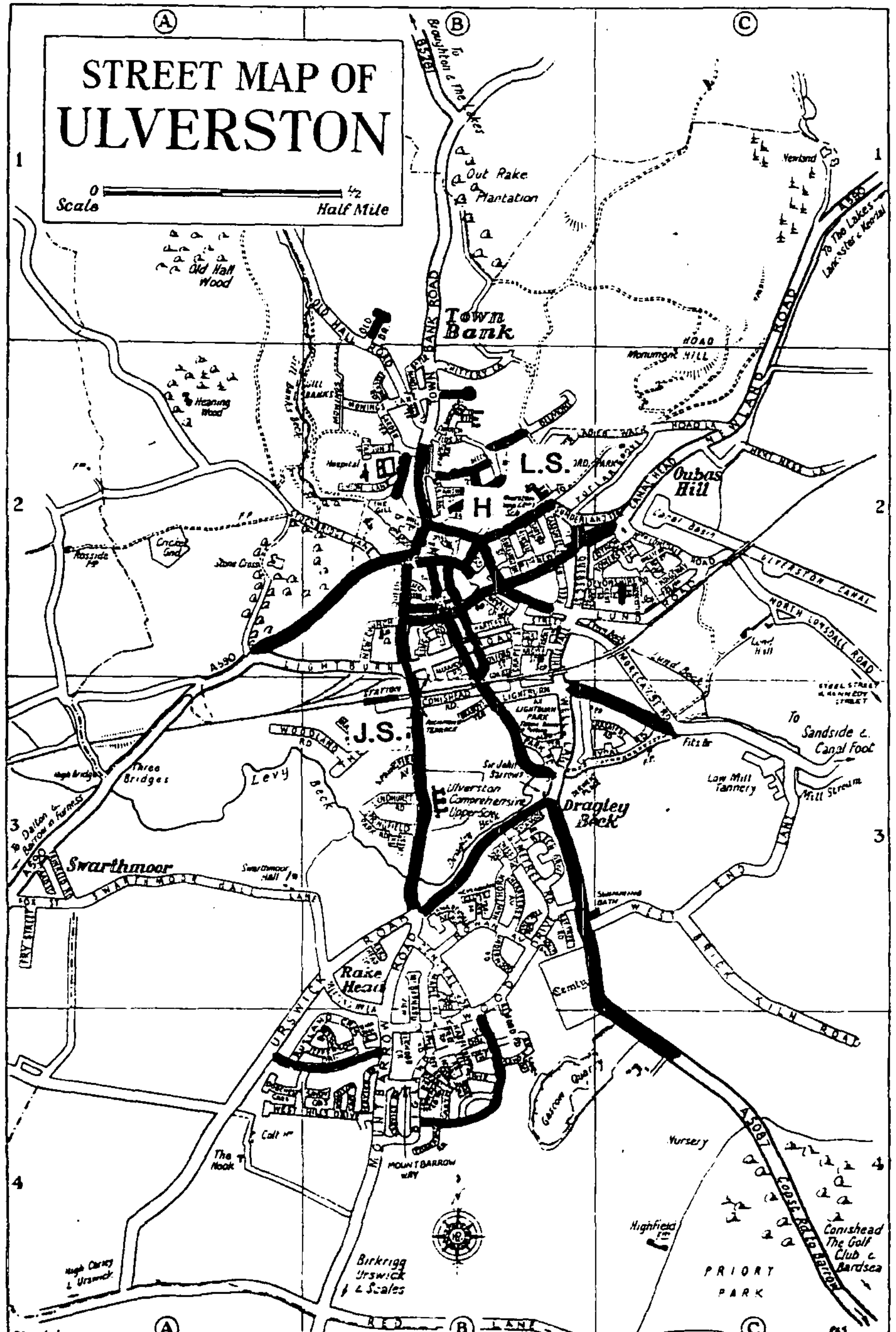


Fig. 7.2a

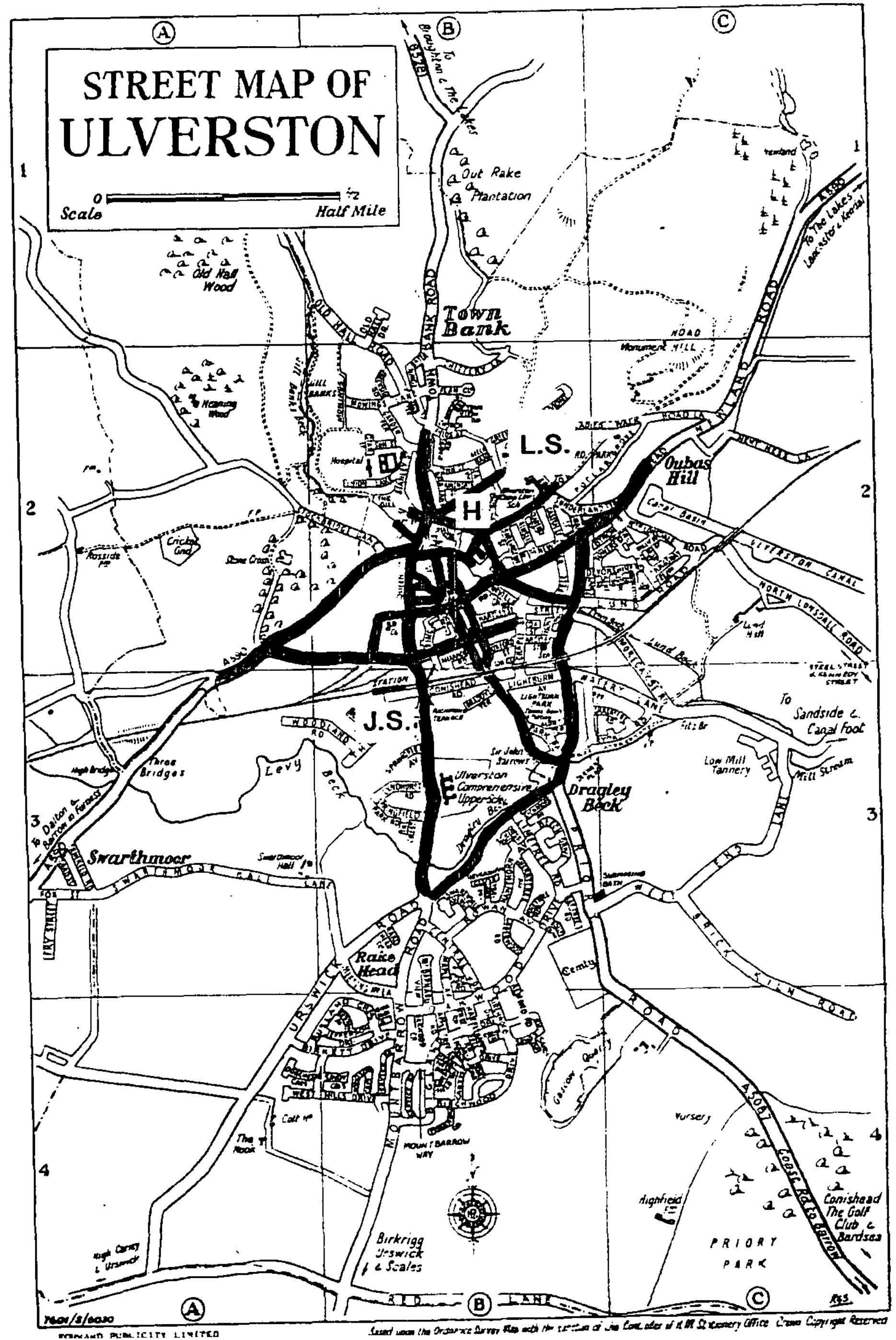


Fig. 7.2b

Fig. 7.3 Comparison of sketch map by Boy B and the location of streets from his list on a street plan. Lower School, 1978

a) sketch map by Boy B
b) streets from Boy B's list marked on a street plan, showing the location o his home, junior school and the Lower School

H - Home
JS - Junior School
LS - Lower School

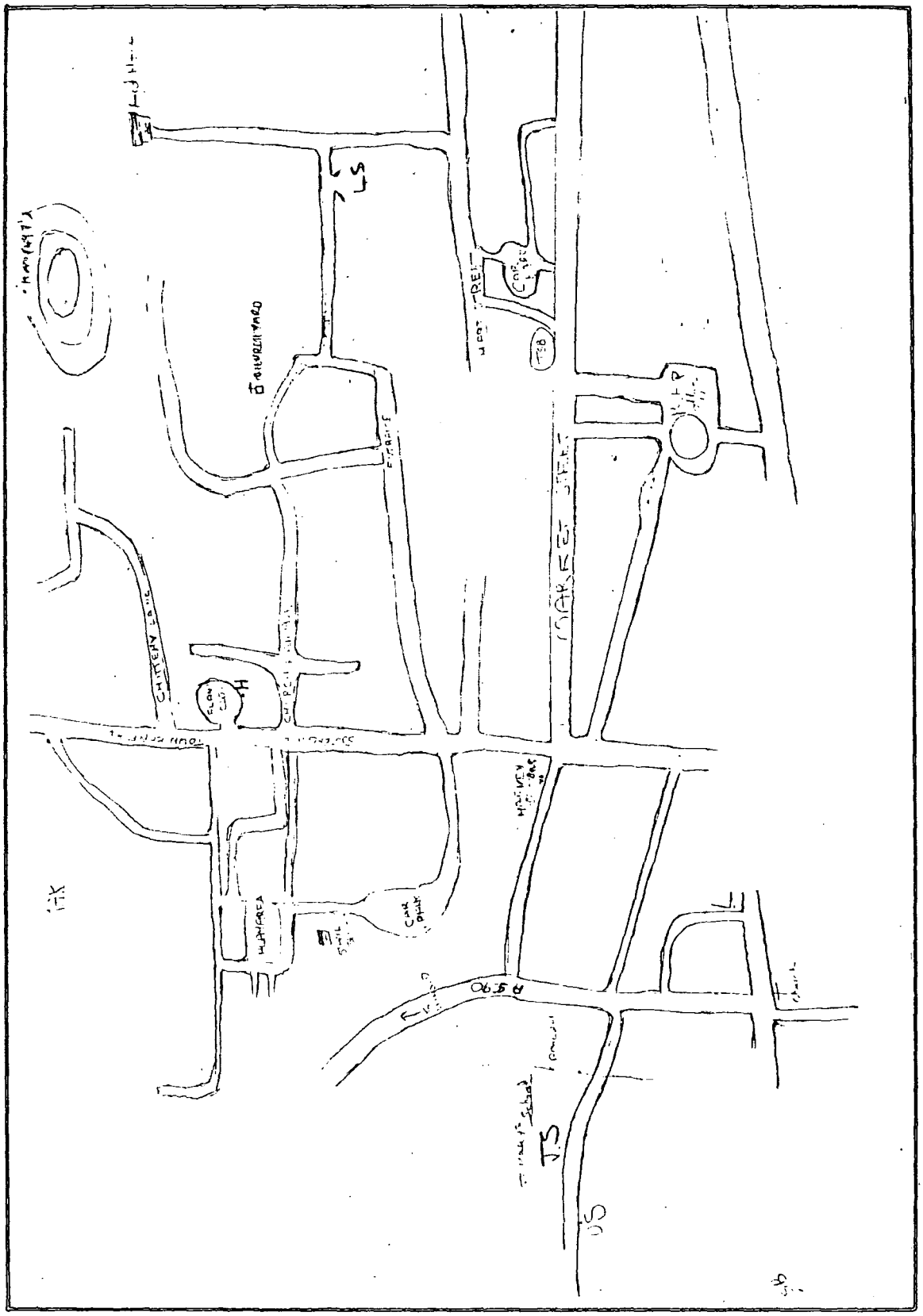


Fig. 7.3a. Boy B, 1978

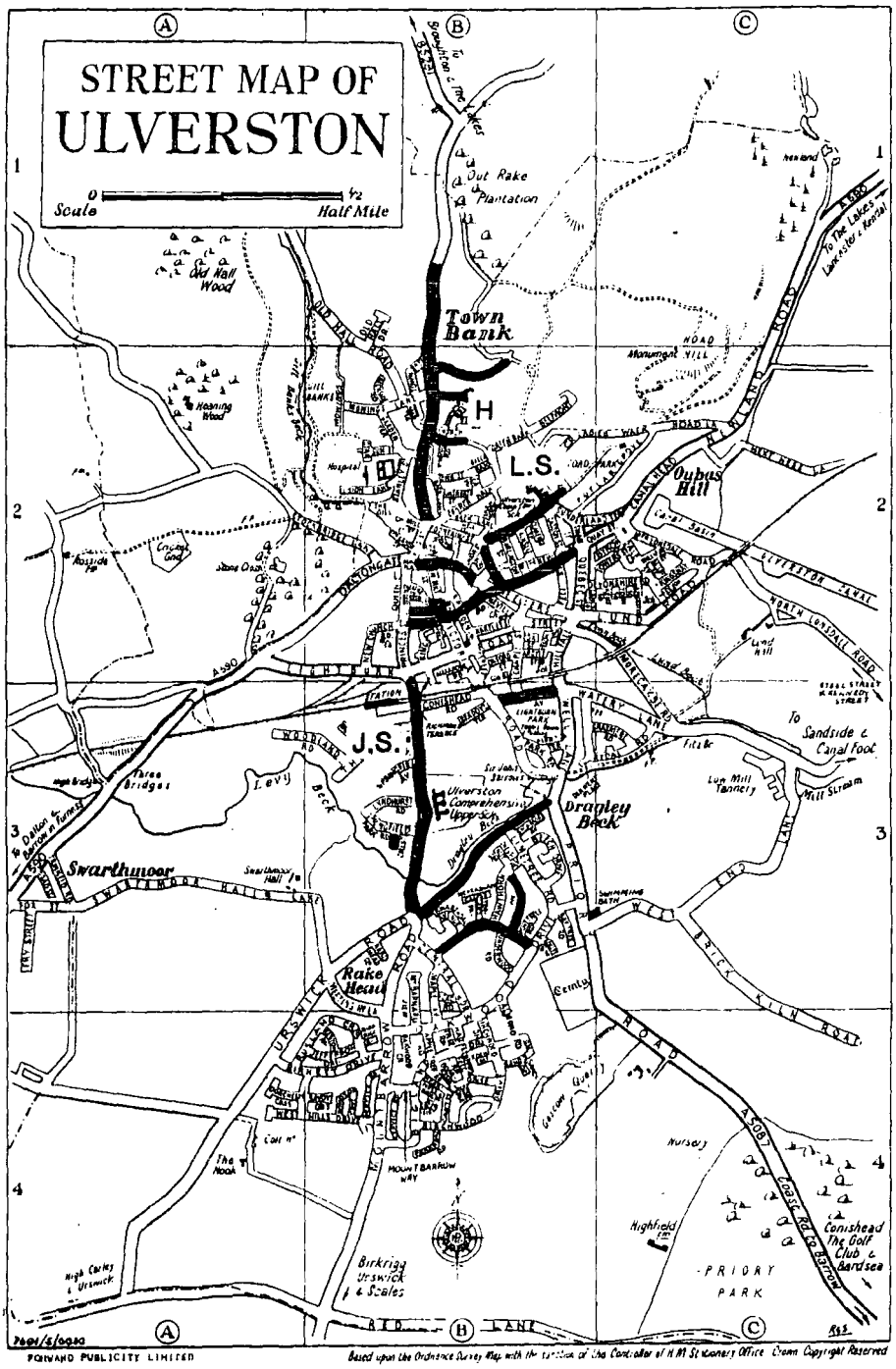


Fig. 7.3b. Boy B's listed streets

Fig. 7.4 Comparison of sketch map by Girl C and the location of roads from her list on a street plan. Lower School, 1978

a) sketch map by Girl C
b) location of streets from Girl C's list, on a street plan, showing the location of her home, junior school and the Lower School

H - Home
JS - Junior School
LS - Lower School

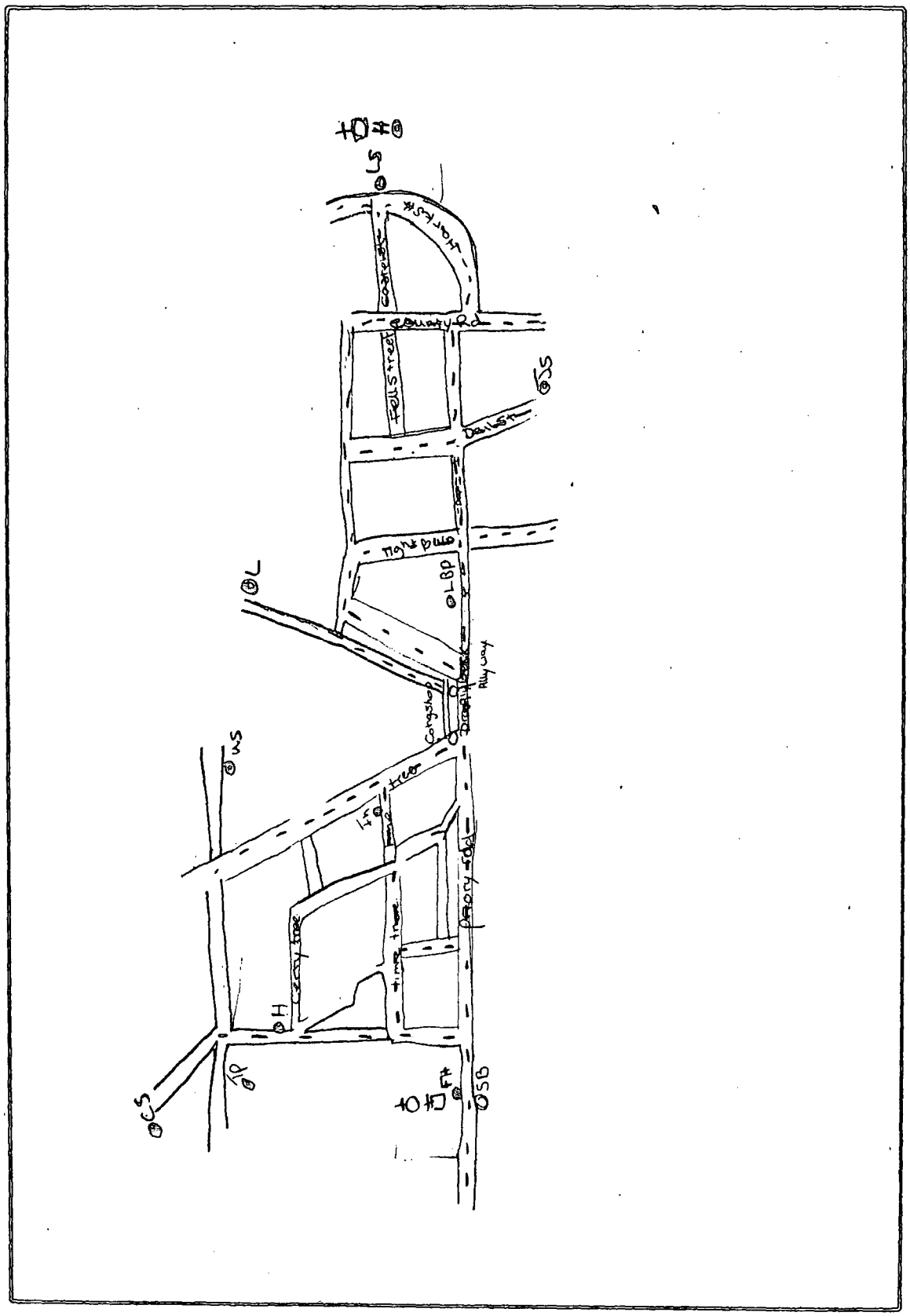


Fig. 7.4a. Girl C,1978

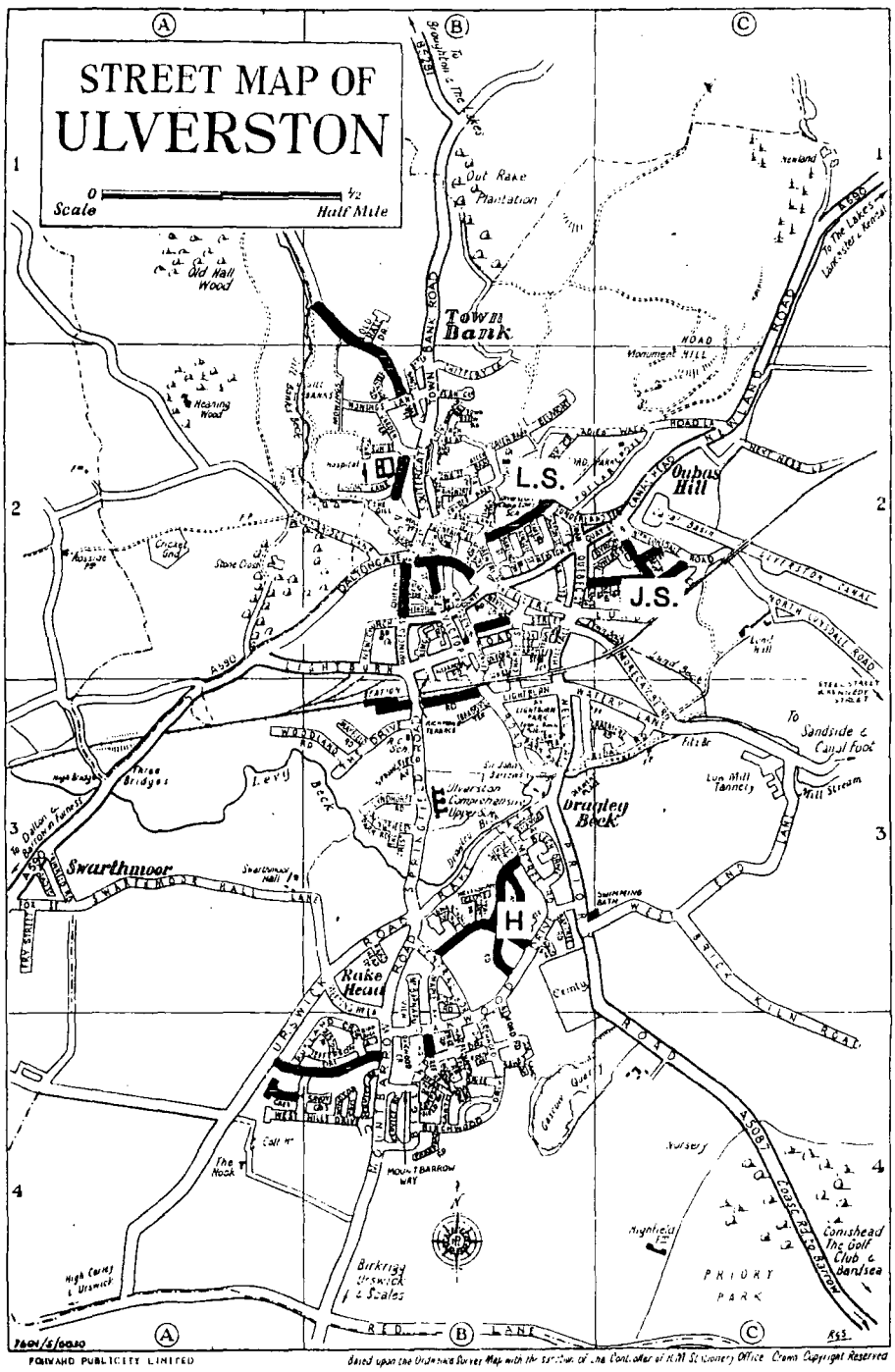


Fig. 7.4b. Girl C's listed streets

baths. This gives a guide for comparison both of scale and orientation between the 1977 and 1978 maps.

Pictorial representation was rare at Croftlands in 1977, but Boy D when asked for a birds eye view completed his drawing with a profile of hills (see Fig. 7.5). His map the next year had become more symbolic and included the railway but lacked the vitality and detail of the earlier drawing. The Lower School and the Brewery were on both the maps. The health centre is included in 1978, and is on one of the roads into town. The hospital and police station are represented in 1977, along with the library and Coronation Hall, all of which are situated in the older part of the town. The boy lived on the Croftlands estate and the change is to a more simplified layout of the three main arteries from the Croftlands estate into town and to the Lower School, whereas only one connecting road was shown in the 1977 drawing.

Another lad, Boy E, showed a similar simplification with time. His roads had become single line representations with the exception of the county road, and on the 1978 map there is a legend to identify the various locations of pubs, public buildings etc. Although the station is indicated no railway line is drawn. Topologically most connections were correct but the relative distances were as distorted as in the 1977 map. Three more public houses had been added on the 1978 map and the total locations had risen from 18 to 23; the number of roads indicated had also increased from 18 to 35 . In 1977 and 1978 two main roads into town had been marked (Fig. 7.6).

Two maps from Girl F show more typical developmental patterns where the distance from Croftlands School to the swimming baths,

Figures 7.5 - 7.8. Comparison of sketch maps drawn by children in 1977 and 1978. Map A was drawn at Croftlands School in 1977, Map B in each instance was drawn by the same child at the Lower School in 1978.

A triangle has been drawn by the author joining the locations of home, junior school and the swimming baths. Other straight lines were drawn by the author for measurement purposes.

The children used rubbers and some of their work was rather messy, but these drawings illustrate the raw data from which counts of roads and measurements were made.

Fig. 7.5. Comparison of sketch maps drawn by Boy D in 1977 and 1978

a) sketch map drawn at Croftlands School in 1977
b) sketch map drawn at the Lower School in 1978

The grid in Fig. 7.5a was drawn by Boy D before he started his map

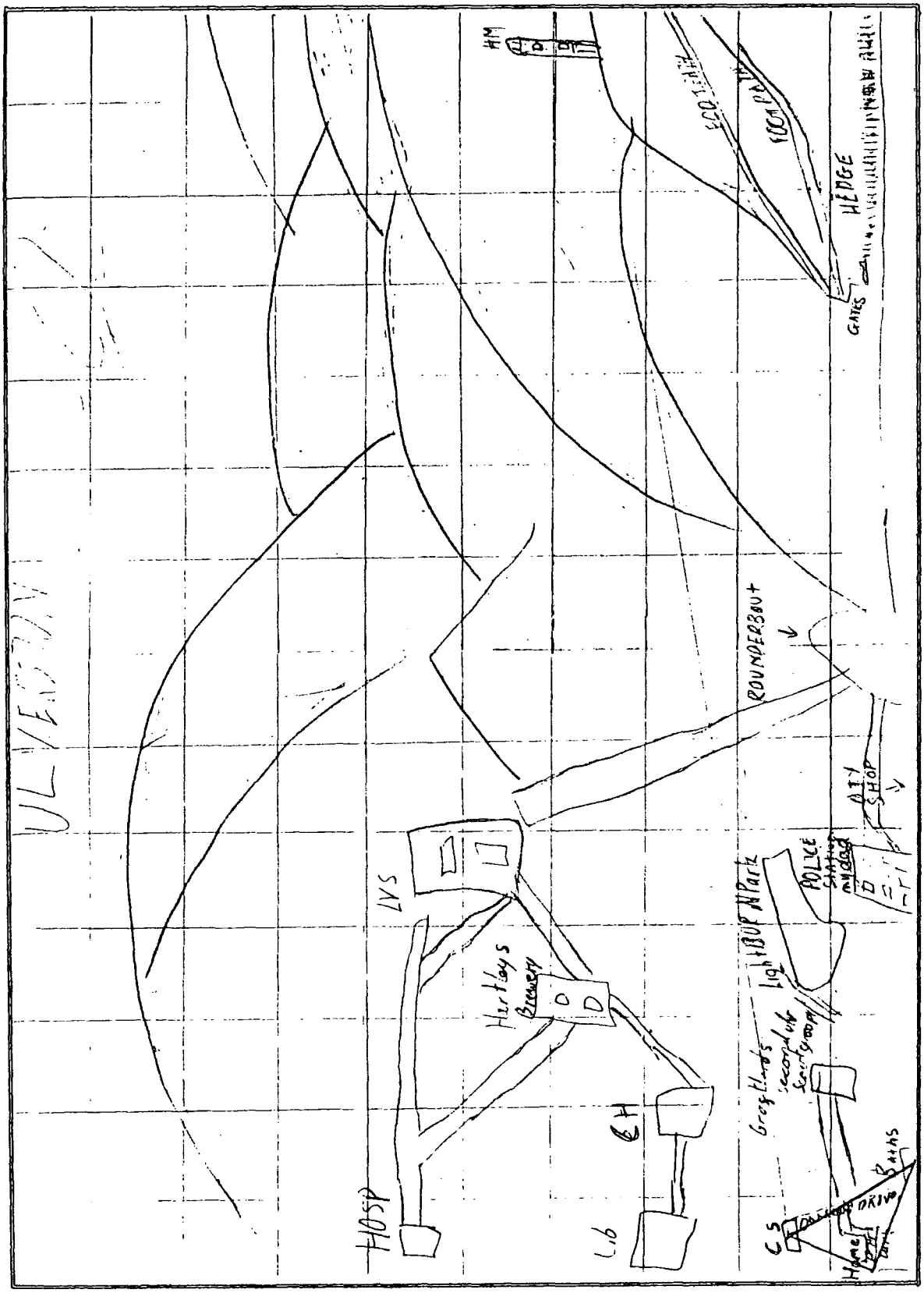


Fig. 7.5a Boy D, 1977

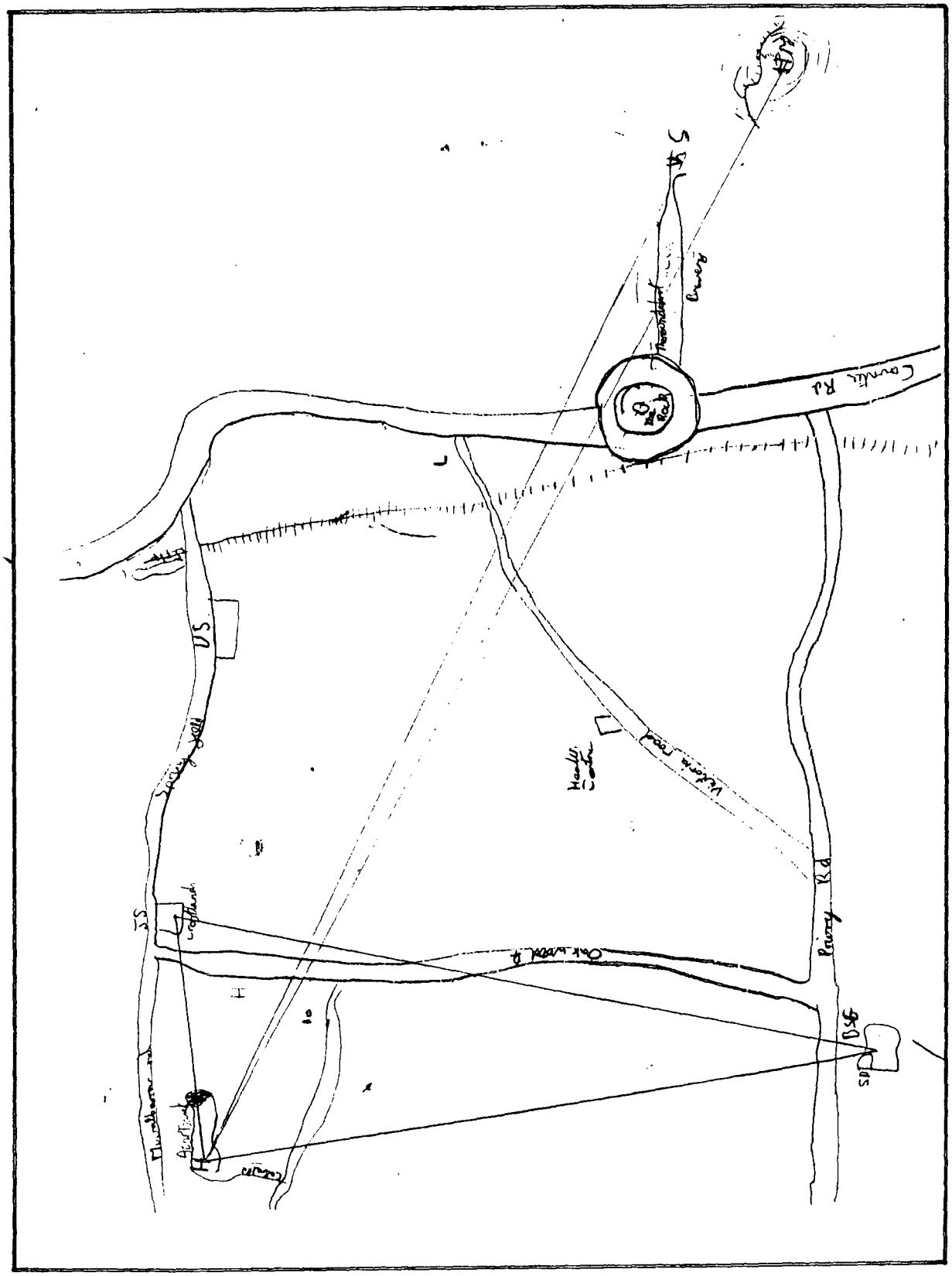


Fig. 7.5b Boy D, 1978

Fig. 7.6 Comparison of Sketch maps drawn by Boy E in 1977 and 1978

a) sketch map drawn at Croftlands School in 1977
b) sketch map drawn at the Lower School in 1978

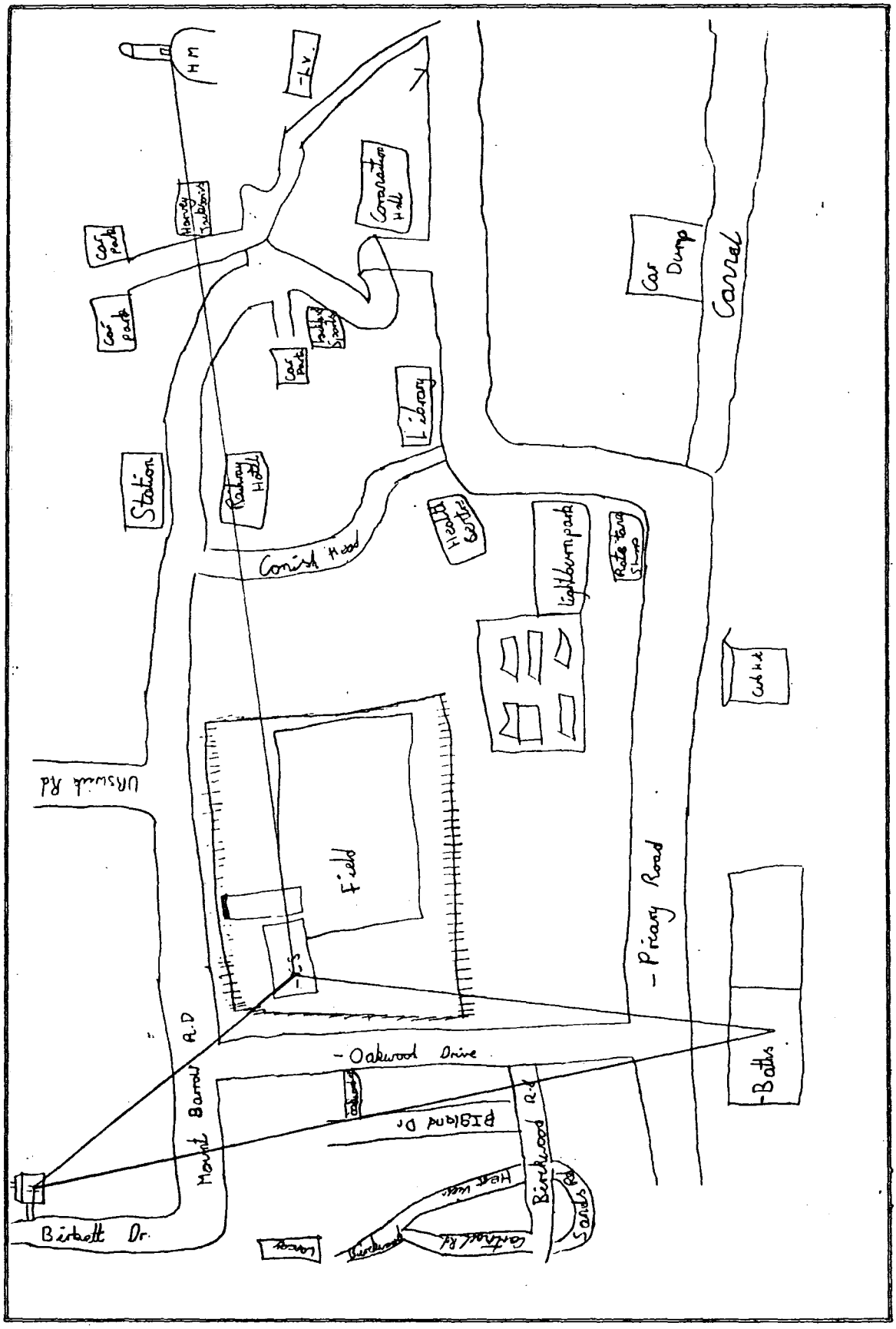


Fig. 7.6a Boy E, 1977

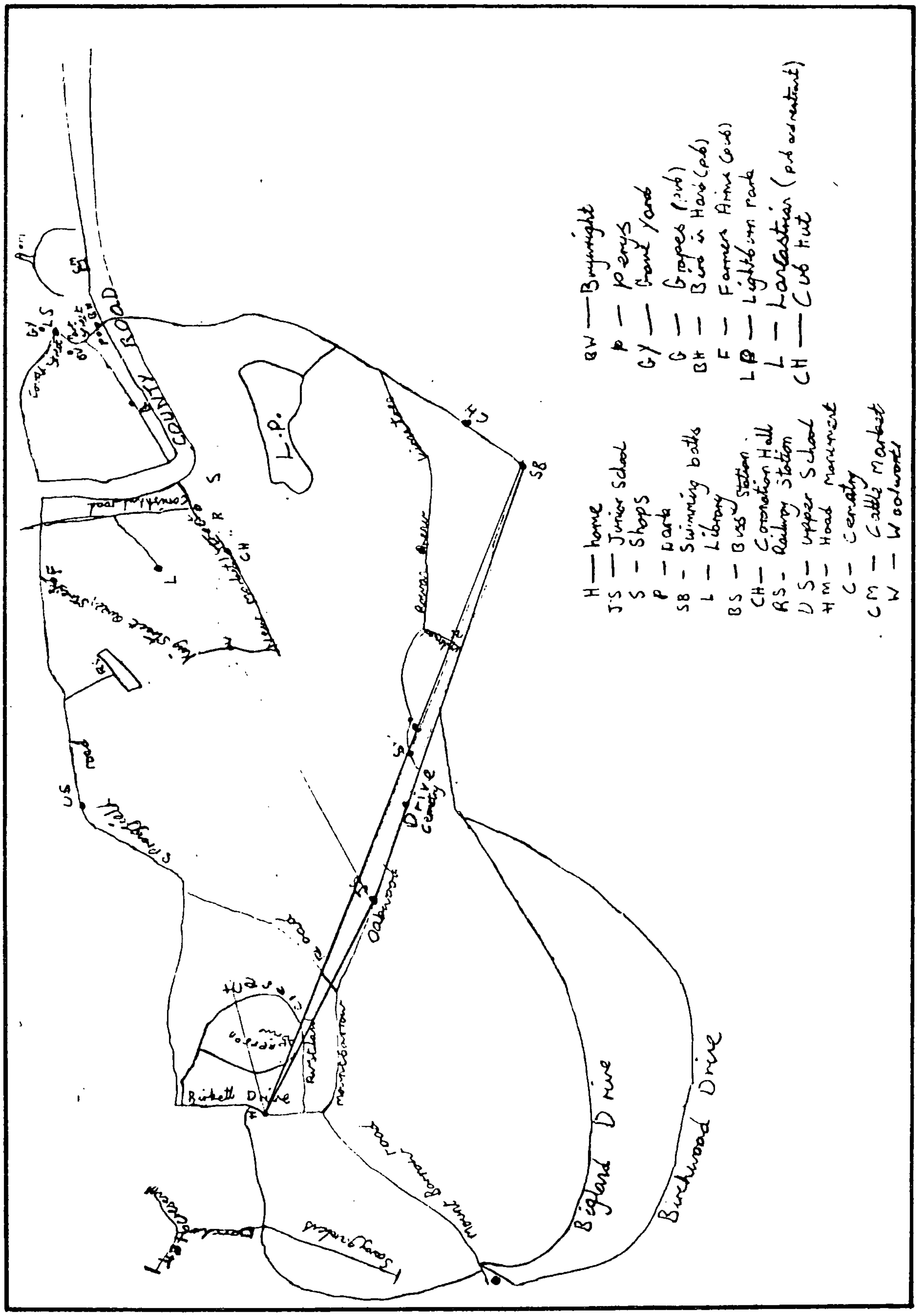


Fig. 7.6b Boy E, 1978

Fig. 7.7 Comparison of sketch maps drawn by Girl F in 1977 and 1978

a) sketch map drawn at Croftlands School in 1977
b) sketch map drawn at the Lower School in 1978

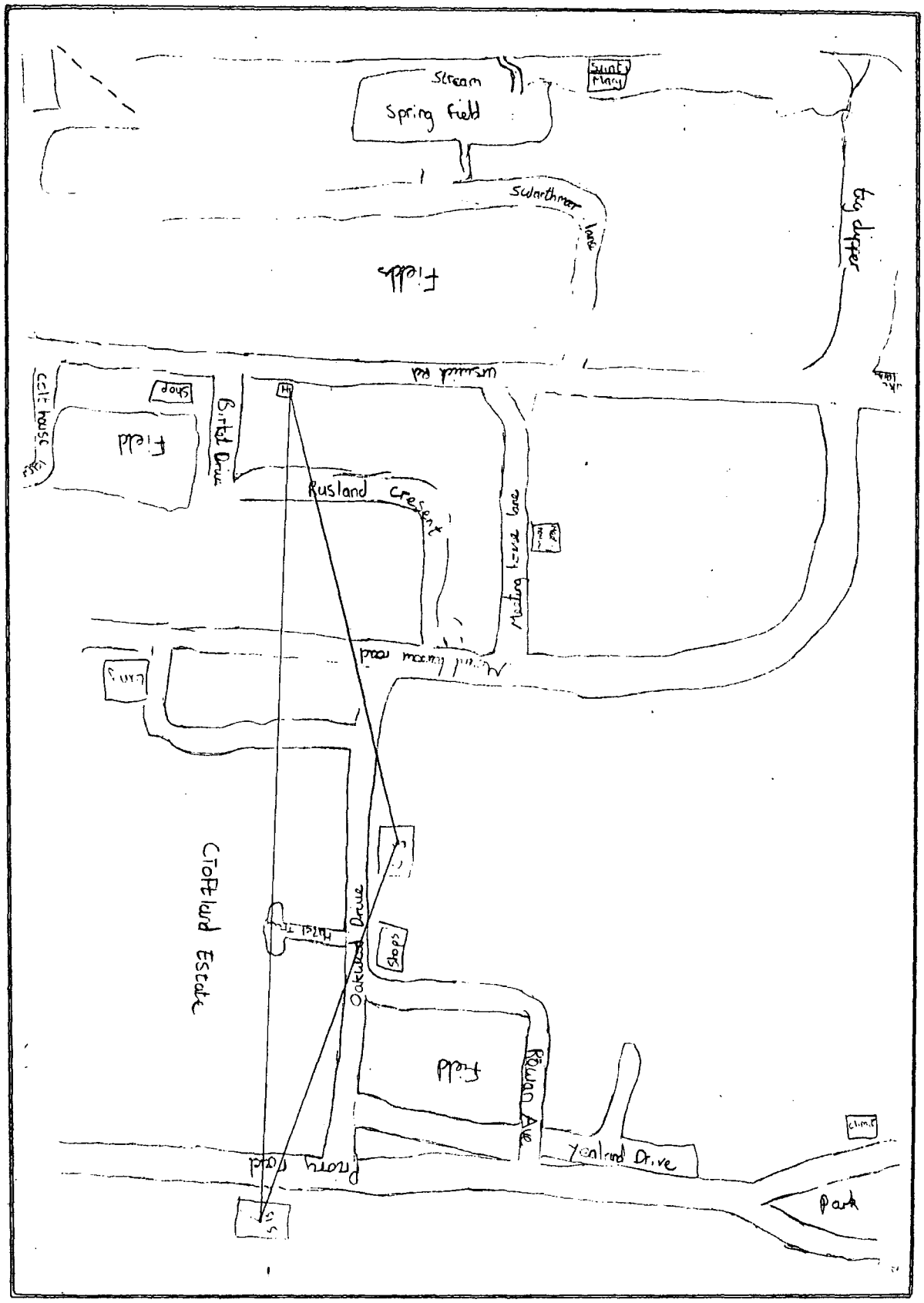


Fig. 7.7a Girl F, 1977

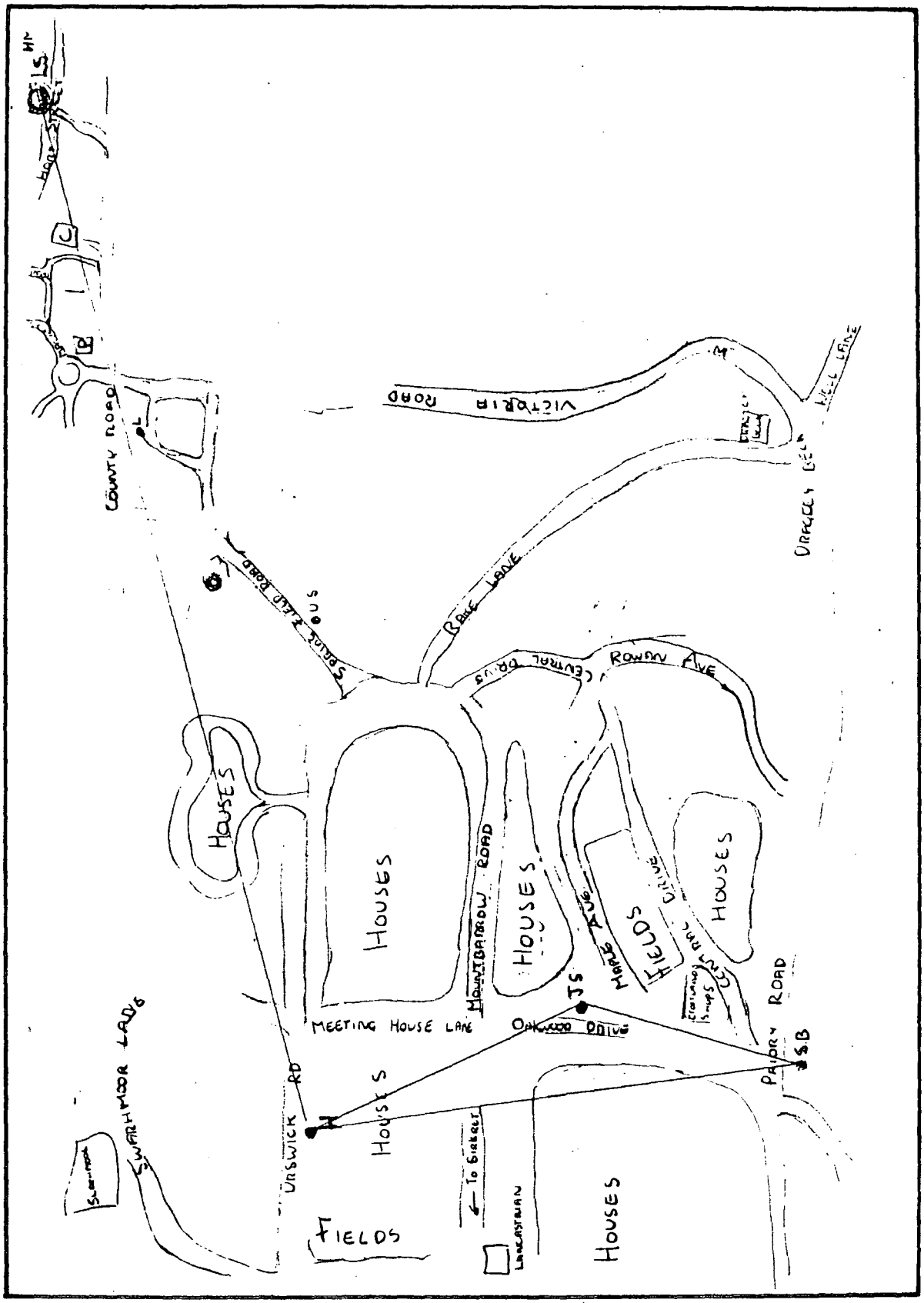


Fig. 7.7b Girl F, 1978

Fig. 7.8 Comparison of sketch maps drawn by Girl G in 1977 and 1978

a) sketch map drawn at Croftlands School in 1977
b) sketch map drawn at the Lower School in 1978

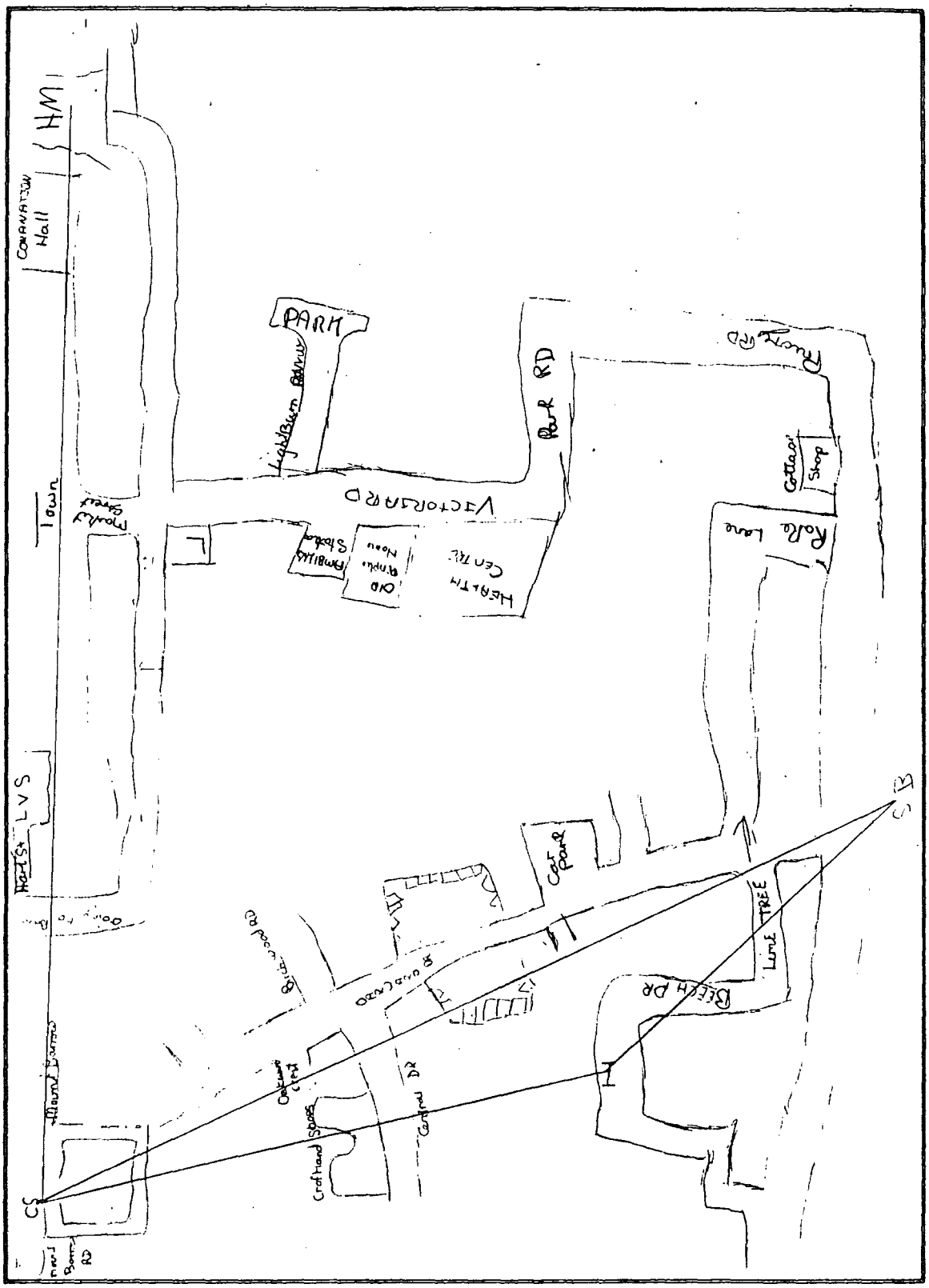


Fig. 7.8a Girl G, 1977

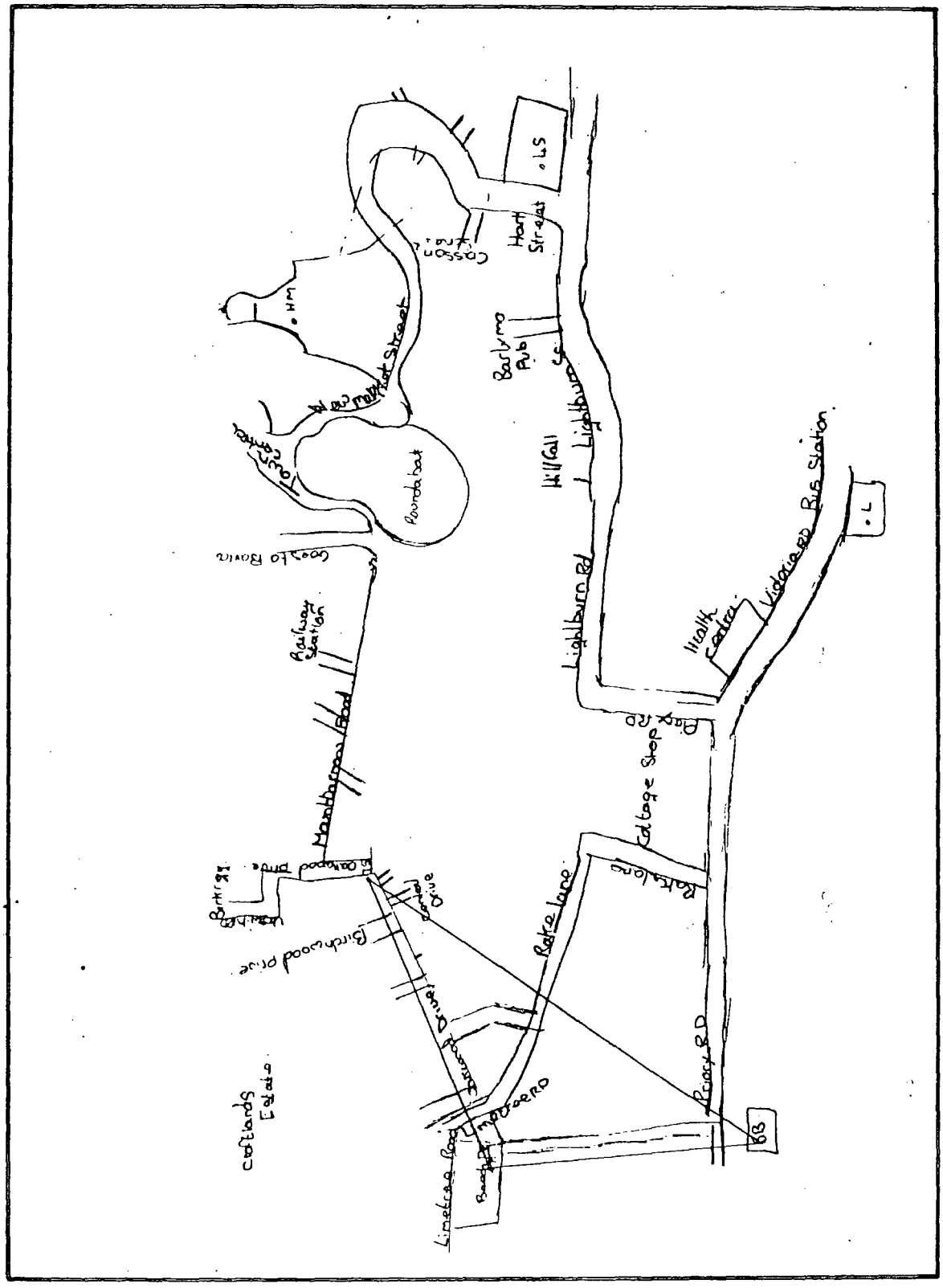
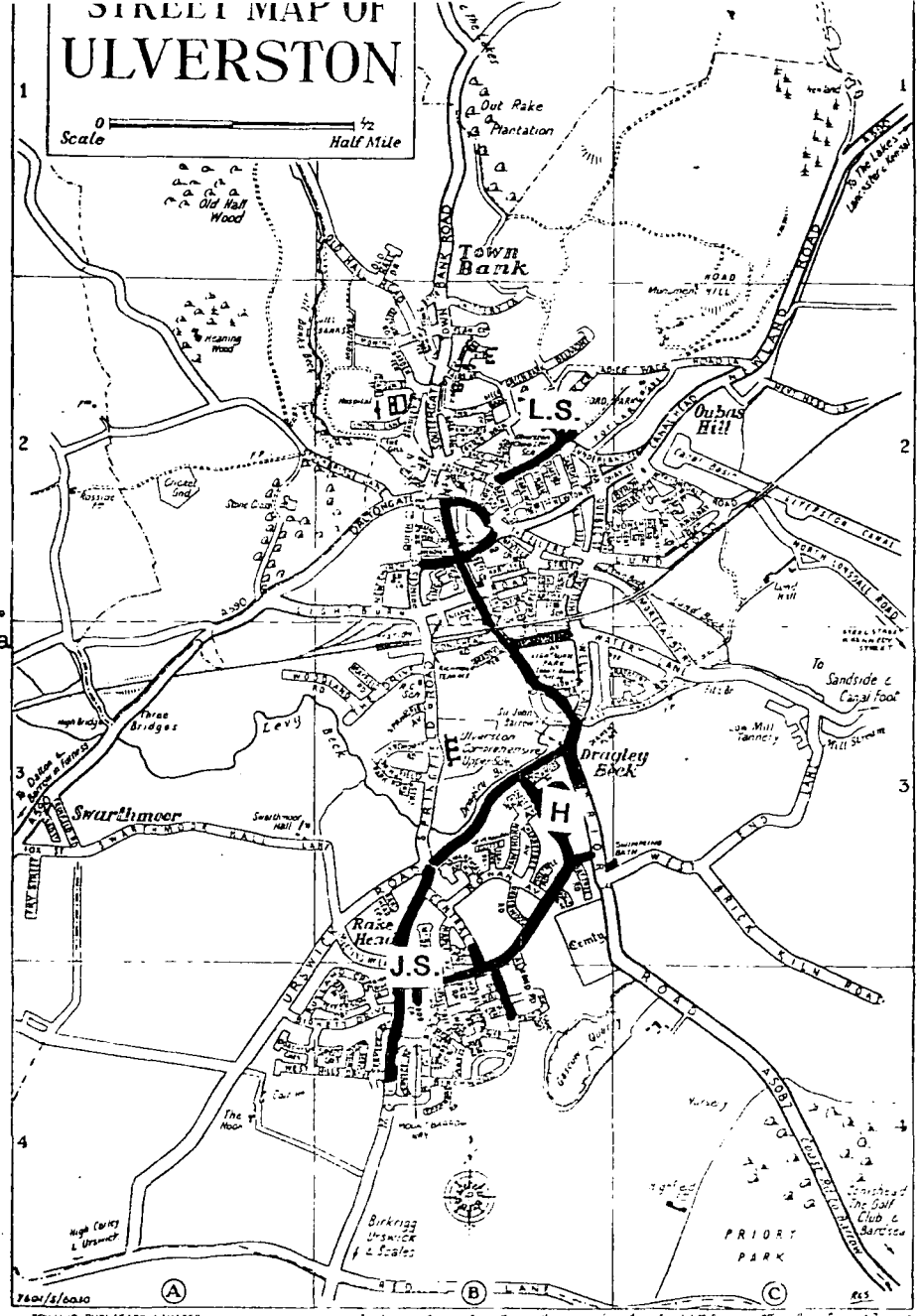


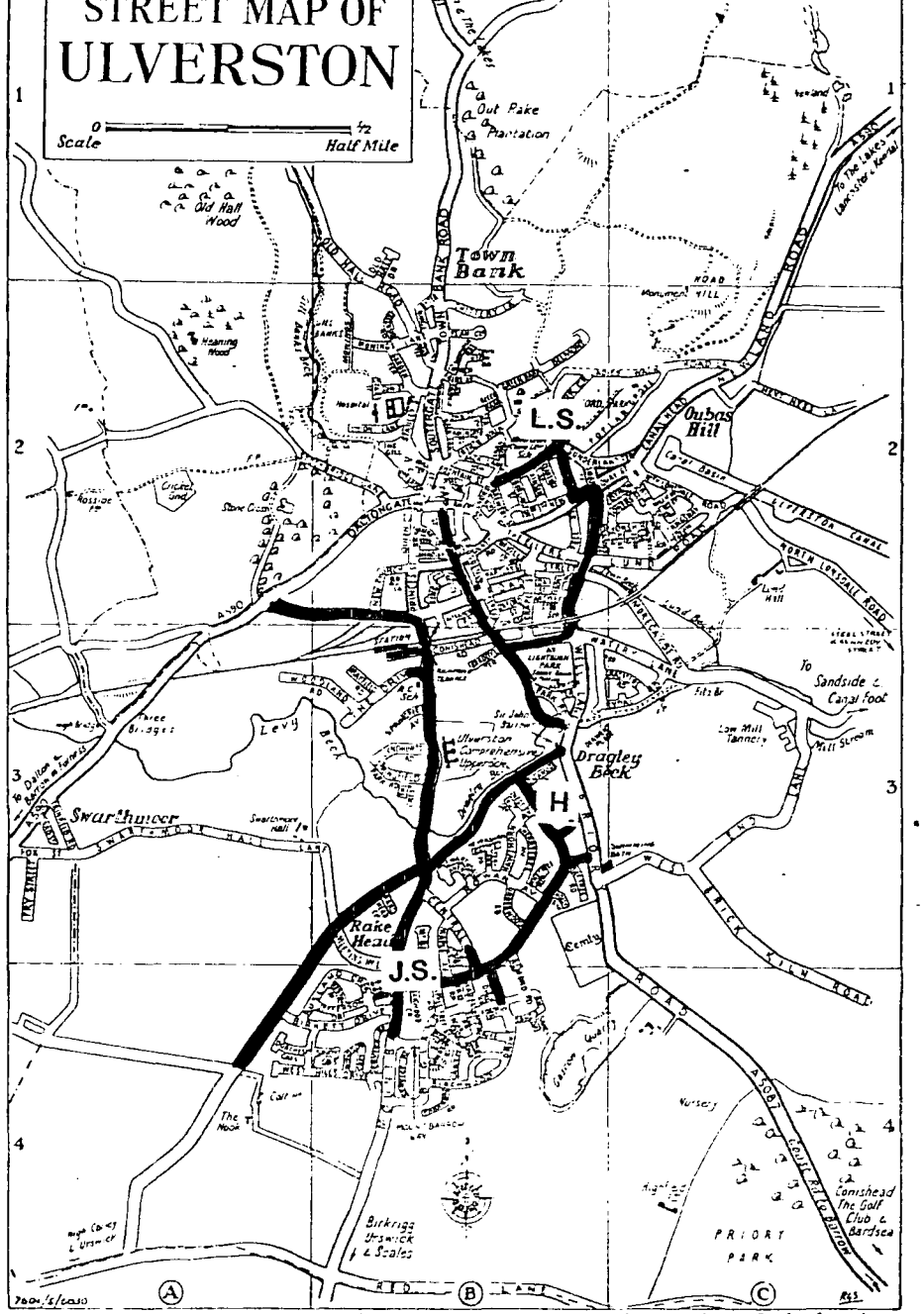
Fig. 7.8b Girl G, 1978

Fig. 7.9 Comparison of the location of roads from sketch maps by the same child, Girl G, in 1977 and 1978.

The locations of her home, junior school and the Lower School are indicated.

H - Home
JS - Junior School
LS - Lower School


STREET MAP OF
ULVERSTON
Scale
0
½
Half Mile
Old Hall Wood
Out Rake
Plantation
Town Bank
Hoaring Wood
Oubas Hill
L.S.
Three Bridges
Levy
Beck
Dragley Beck
Swarthmoor
H
Rake Head
J.S.
Birkrigg
Urswick
& Scales
PRIORY PARK
Conishead Priory Golf Club & Bardsea
To Sandside & Canal foot
Low Mill Tannery
Ulverston Comprehensive Upper School
Cemty
The Moor
Nursery
Cricket Gnd
Stone Quarry
Lund Hill
Monument Hill
Hospital
Swarthmoor Hall
Swimming Bath
Garrison
Quarry
Mill Stream
Sand Banks
Fig. 7.9a
1977


STREET MAP OF
ULVERSTON
Scale
0
½
Half Mile
Old Hall Wood
Out Rake
Plantation
Town Bank
Hoaring Wood
Oubas Hill
L.S.
Three Bridges
Levy
Beck
Dragley Beck
Swarthmoor
H
Rake Head
J.S.
Birkrigg
Urswick
& Scales
PRIORY PARK
Conishead Priory Golf Club & Bardsea
To Sandside & Canal foot
Low Mill Tannery
Ulverston Comprehensive Upper School
Cemty
The Moor
Nursery
Cricket Gnd
Stone Quarry
Lund Hill
Monument Hill
Hospital
Swarthmoor Hall
Swimming Bath
Garrison
Quarry
Mill Stream
Sand Banks
Fig. 7.9b
1978

approximately the length of Oakwood Drive, the main road through the Croftlands estate, has been reduced and rotated to allow more space for representation of the town (Fig. 7.7). This girl showed almost none of the town centre in the 1977 map, detailing all her roads in the area of home and the Croftlands Estate. Her 1978 map was better placed on the page and included two roads from Croftlands into town together with a general increase in information.

Another pair of maps (Fig. 7.8), by Girl G, shows a similar reduction and rotation, and some interesting right-left reversals. In 1977 Birchwood Drive and Central Drive have been marked on the wrong sides but Victoria road, leading into the town, has been correctly placed. In 1978 Birchwood Drive and Central Drive are on their correct sides, but Victoria Road has been placed on the wrong side of Priory Road. This is somewhat surprising as on her questionnaire she indicated that she walked to the Lower School along Victoria Road and returned by bus. She clearly also uses the two other roads into town for her activities include gymnastics at the Upper School on the Springfield Road, and swimming at the baths on Priory Road. She mentions her halfway point as being on Hill Fall, an extension of Priory Road; though this is not her usual route to school. It was possible to identify nearly all the roads on her maps, and these are shown marked on street plans in Fig. 7.9 to give another comparison.

The general increase in information over the year was demonstrated by the quantitative results mentioned earlier. To some extent any increase in information demands a more complicated map; but those from the last two girls considered (Figs. 7.7 & 7.8) show that such increased sophistication may not result in any marked development in style.

As has been mentioned not all children attended their local junior school, but travelled to a school further away.

Girl H, who had attended Dale Street Girls School while living on the Croftlands Estate, listed in all 26 roads, of which 21 were on the estate. She was brought home from school by car each day and though she attended several out of school activities in town, she may have been taken to these by car. It was instructive to compare her list with the common list for the Dale Street intake (i.e. the common roads listed by over a quarter of the intake); she included 8 out of 30, a proportion of 0.26. Comparison with the shared list for the Croftlands intake gave 11 out of 49, a proportion of 0.22, and this in spite of the very high number of roads on the estate listed by her. Although the difference is slight it is suggestive of the influence of the primary school.

Differences between individuals

Ladd[2] compared the maps of two brothers. This present discussion of differences between individuals starts with the consideration of a pair of twin girls, Girl I and Girl J. Girl I was in form IA/B and Girl J in form ICt and their maps are shown in Fig. 7.10. Typically the simpler map belongs to the twin in the lower band. However, when their lists of roads are examined the differences are less obvious. The twin from form IA/B listed 37 roads and gave her outside activities as the St. John Ambulence Brigade and Sunday School, the twin in form ICt listed 35 roads and gave as her activity only the St. John Ambulence Brigade. 23 of the roads were common to the two lists, and this suggests very similar behaviour patterns. This overlapping of the lists of road names is the closest among all pairs of individuals examined.

Fig. 7.10 Comparison of sketch maps by twin sisters, Lower School 1978.

a) sketch map by Girl I
b) sketch map by Girl J

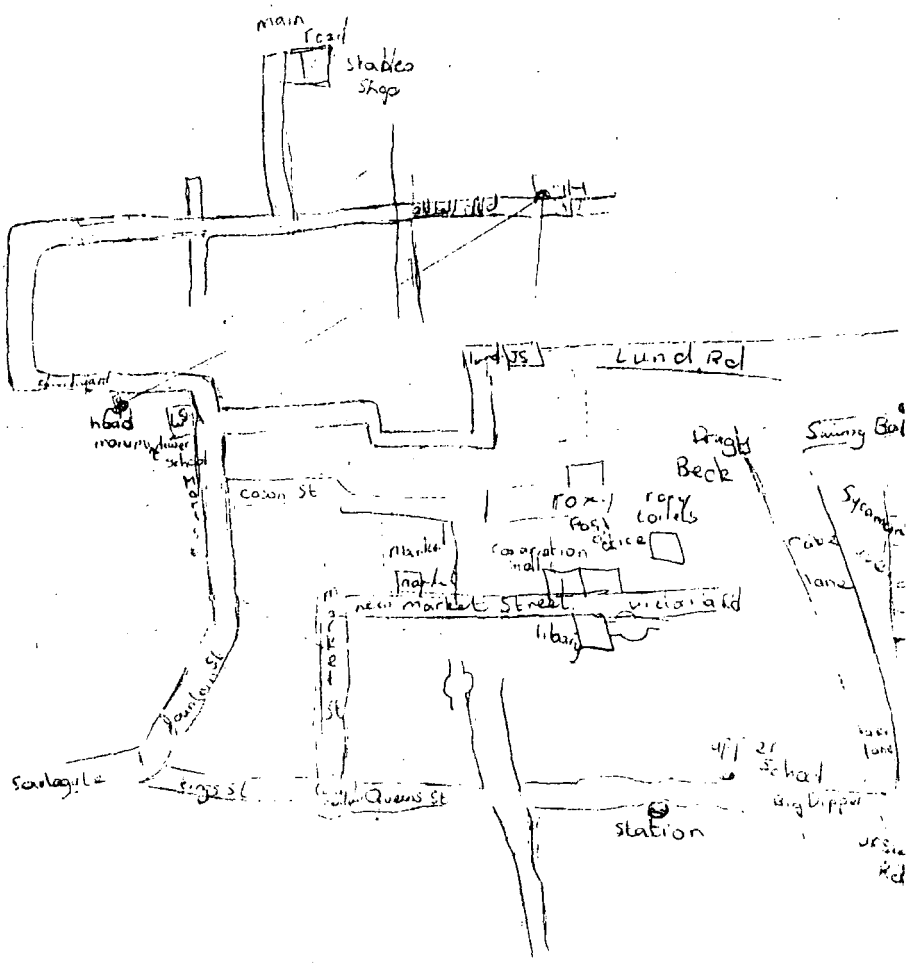


Fig. 7.10b Girl I, 1978

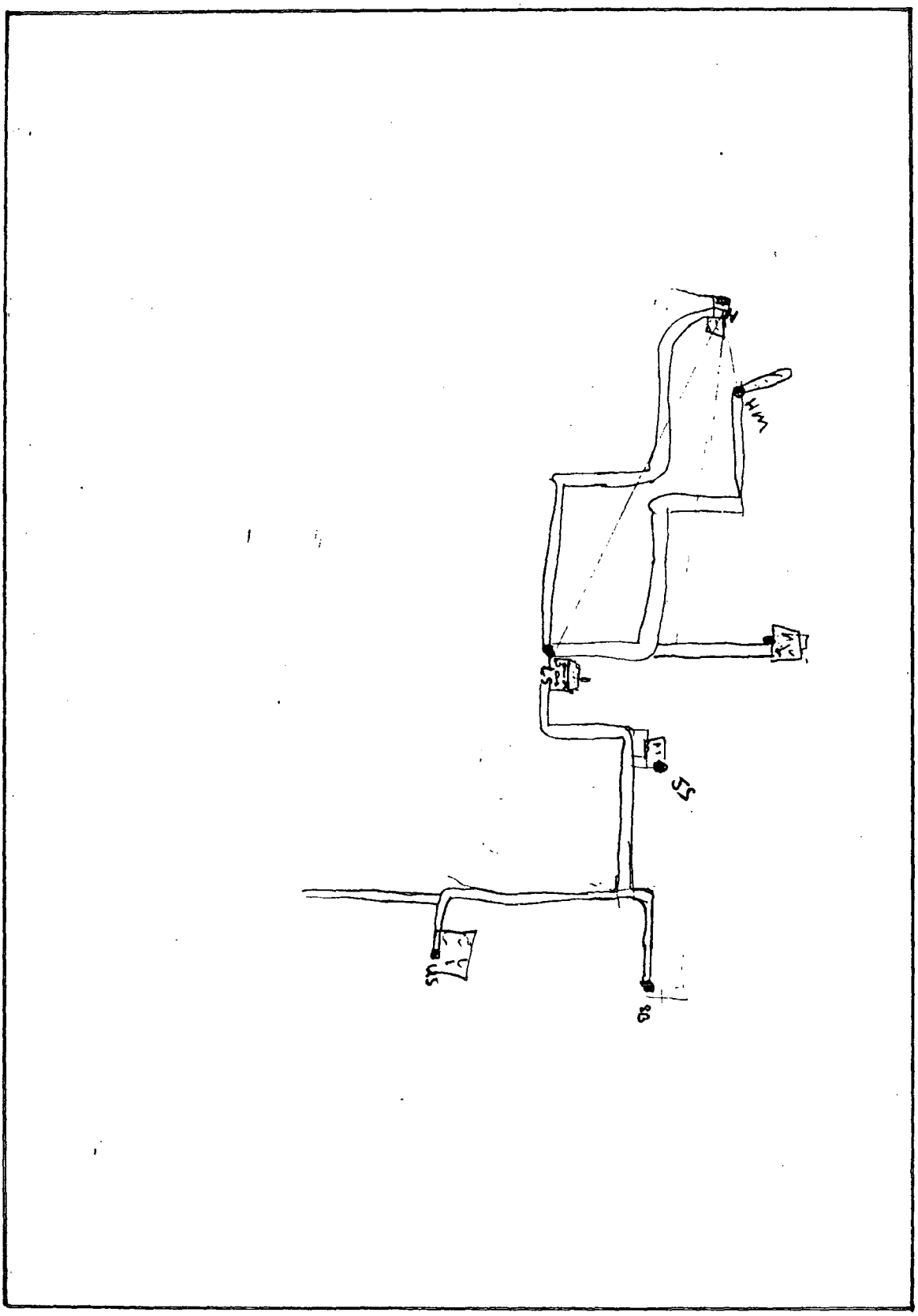


Fig. 7.10b Girl J, 1978

Two brothers, differing in age by eleven months, but in the same year at school, with the younger, Boy K, in form IAg and the older, Boy L, in form IA/B, make an interesting comparison. IA/B is for children of A band with slightly poorer mathematical ability, yet his map is considerably more extensive which does not support the usual linking of mathematical and spatial ability. It could presumably represent the difference in age, but this is not consistent with the difference in the lengths of the two lists. 19 roads on their lists were common to the two brothers, and this could be due to similar behaviour patterns.

Boy K Form IAg		Boy L Form IA/B	
No. of roads on map	25	No. of roads on map	35
No. of named roads on map	19	No. of named roads on map	6
Listed roads	44	Listed roads	33
Activities: Choir, Scouts		Activities: Scouts, Table Tennis Judo, Cricket, Choir, Tennis	

Table 7.1 Comparison of some characteristics of two brothers and their knowledge of streets in Ulverston derived from their lists. Lower School 1978

One interesting observation is that one brother said the Hoad Monument was not visible from home and the other said it was. The one who said it was not had the shorter list of road names. Is this an indication that he was less observant?

The effect of junior school attended on environmental knowledge is illustrated by reference to three boys who lived on the Croftlands estate, but had attended three different junior schools: St Marys, Lightburn and Croftlands.

	Boy M	Boy N	Boy O
Home	Croftlands	Croftlands	Croftlands
Junior School	St Marys	Lightburn	Croftlands
Journey to Lower School	Car	Bicycle	Bicycle
No. of roads in list	36	39	32
No. of roads on estate	19	12	12
No. of roads in town	17	27	20
Form - Lower School	IA/B	I/Bx	I/Bx
Out of school activities:			
Number	5	1	1
Place	Croftlands & town	town	Croftlands

Table 7.2 Comparison of some characteristics of three boys and their knowledge of streets in Ulverston derived from their lists. Lower School 1978

The greater proportion of roads on the estate and the mode of transport to school suggests that Boy M spends most of his time around the estate. St Marys is a small school with a wide catchment area, so that his junior school may have been less influential in his friendship patterns than his neighbourhood. His proportion of roads on the Croftlands estate is higher even than that of Boy O who had attended Croftlands School. Attendence at Lightburn School seems to have influenced the scout troop to which Boy N belongs, for it is in the town at the Gill, compared with Boy O whose scout troop is at Dragley Beck near Croftlands. This could explain why Boy N has the highest number of roads in town on his list. But both he and Boy O have more than Boy M perhaps because they use bicycles.

Looking at roads common to two lists, Boys M and O share the most town roads (9), with Boy N from Lightburn listing rather different ones. Among roads on the Croftlands estate Boys M and N share least although they lived closest.

Since all the children attend the Lower School, and will need to use the town centre at some time there will be both opportunity and motivation for learning roads in town. For children who live in the town centre there may be no need to travel to the Croftlands estate; though every child is likely to know someone who lives at Croftlands, and may at some time travel out to the swimming baths on the edge of the estate.

Comparison of the lists of two C band children, Boy P and Girl Q who both live in the town centre, again shows the probable effect of primary school attended. Proportionately the girl knows more roads on the Croftlands estate, as would be expected. Considering how near to each other they live it is surprising that they list so few town roads in common. This probably reflects differences in movement patterns. Where, as in this case, lists are short, the overlap between the lists is likely to be small.

	Boy P	Girl Q
Home	Market Street	Market Place
Junior School	Lightburn	Croftlands
No. of roads on list	21	19
No. of roads in town	18	14
No. of roads on Croftlands estate	3	5
Roads common to both:		
in town	4	
Croftlands	2	
Journey to school	Bicycle	Walk

Table 7.3 Comparison of some characteristics of a girl and a boy and their knowledge of streets in Ulverston derived from their lists. Lower School 1978

SUMMARY

This chapter has illustrated some of the wide individual differences in knowledge of the town. The importance of the junior school in influencing which parts of the town are known is suggested by data from individuals as well as from the groups mentioned in the last chapter.

Several different methods of comparison were employed, in attempts to reveal different aspects of the data. The spatial arrangement of roads on lists were demonstrated by marking them on a street plan. Division of the town into the older part and the newer extended Croftlands estate provides a rough guide to the dispersion of information held by the children. The role of attendence at specific venues for out of school activities in terms of environmental learning is somewhat speculative in the individual cases discussed.

These illustrations were intended to complement the material of earlier chapters. In the final chapter which follows some assessment of methods is made, and the findings are related to other studies.

[1]Downs, R.M. & Stea, D. (1977) Maps in Minds. Reflections on Cognitive Mapping, New York, Harper & Row.

[2]Ladd, F.C. (1970) 'Black youths view their neighbourhood', Environment and Behaviour 2, 74-99.

CHAPTER VIII

Discussion and Conclusions

In this final chapter the methods employed in collecting and analysing the data are examined so that a proper consideration may be given to the interpretation of the evidence. The findings are discussed and compared with some recent relevant studies. Some possible lines of research suggested by the present work are mentioned.

METHODS

The basic data for this study was derived from questionnaires, diaries (see Appendix), sketch maps and lists of roads. For convenience the questionnaires had multiple choice answers and this limits their use to testing for preconceived hypotheses, for rarely is there the possibility of both generating and testing for alternative hypotheses. If a significant factor has been omitted from the questionnaire design, no indication of its possible importance is available. Also, set questions pose problems for the children who sometimes fail to find the answer they would like to give among the choices, and may mark more than one answer which then poses problems of categorisation for the researcher. Although the questions in this study were apparently factual, e.g. how do you go to school, and it was stressed that the most frequent mode of transport should be recorded, it was still possible that subjectively one mode of transport, e.g. going by car, somehow assumed more importance in a childs mind than the habitual walk. However most of the data on behaviour collected appeared plausible and fitted in with results from other studies.[1]

The diaries were much more open ended, and yielded a wide variety of information. Although the original purpose, to establish a measure of home range, was not achieved through insufficient data, various other questions of interpretation of results arose through examination of all the data, and some of these were illuminated by tests based on the diaries. However they were time-consuming, being completed each morning at school, and it was impractical to consider using them in the Lower School.

The sketch maps too were a source of much data. The author attachs some importance to giving the children a sufficiently large piece of good quality paper - in this case A3 cartridge paper, which probably encouraged them to view it more like an art exercise calling for an individual production. They used rubbers but were asked not to use rulers. They also had plenty of time and at Croftlands School appeared to enjoy themselves. At the Lower School there was less time and some maps were marked unfinished. During the drawing it was clear that they were using right and left to help themselves translate a remembered experience to the map, and some were instructing themselves verbally. They were asked to fix certain points on their sheets first in order to encourage them to use most of the page. Several of them ran out of paper and clearly squeezed information onto the edge of the sheet. Some seemed to be able to conceptualise most of the map before they started drawing while others were dependent on clues from their own drawing.

When the children were asked to compile lists of road names they were told they must know ('be able to imagine') the roads, though they were not told that they needed to know where the roads were located.

This is an ambiguity which should be avoided in future work. One or two needed help with spelling, though the author stressed that this was unimportant in this exercise, it is likely that a few children restricted their road names to those they could spell and one child clearly had a reading and writing difficulty.

Analysis of the data

The numbers in these studies were rather small for statistical tests derived from survey data, and when categories were further subdivided they became even smaller. However it is often not until data have been classified by more than one variable that trends are displayed e.g. Table 6.5. Because of these small numbers, the results can only lead to tentative conclusions.

However inspection of the numbers of children used in similar studies,[2] shows comparable sample sizes, and in one of their categories Anderson & Tindall had only a single observation. In the present study there are some empty categories, e.g. in Tables 5.1, 5.2 and 5.3 which illustrate some of the difficulties encountered by researchers in this type of study.

The type of house ownership (privately owned or council housing) is a very simple and rather crude measure of socio-economic group. It was simply obtained from the addresses by reference to the local rating office, and does not involve children or school in questions as to occupation of parents, information that the schools were unwilling to give. However it only identifies the families with larger numbers of children, since many of the council houses in Ulverston are 3 and 4 bedroomed; and within the town there were considerable numbers of families living in terrace housing with gross rateable values well

below that of the council houses. The bias introduced into the study is that the junior schools in the town probably catered for many more less well-off families among their privately-housed group than Croftlands did.

The validity of using such a simple measure as the number of roads indicated on a sketch map, (for a measure of environmental knowing) as widely as it has been used in this study can be questioned. Devlin found it a useful measure to demonstrate growth in environmental learning over time.[3] In discussing children's drawings Harris[4] notes that 'some children will designate by very simple marks at the location the points called to their attention. For these children location of the point is sufficient'. This seems to be justification for using the total number of roads indicated. In his study of distance estimation, Canter[5] clearly distinguishes between the two levels of information given by roads both of whose ends are marked, 'two ended links', and those with only one end marked, 'one ended links'. The consistency of results using the total number of roads indicated over the three years of this study obviated the need to separate the roads in this way; and the correlation with the lists of road names suggests that both are tapping the same core of environmental knowledge. A further justification is the significant value of the correlation coefficient between numbers of roads on maps from the same children in successive years.

The lengths of roads vary enormously, and in using a count of roads it must be assumed that on average the inclusion of long and short roads averages out, so that equal scores can be taken to represent approximately equal measures. There is however the problem that

longer roads represent more experience in transit, and therefore may be more memorable. But inspection of the roads on maps and in lists shows that any length of road may be memorable. Shopping streets in Ulverston are not very long but are frequently included on maps and in lists, as too are some short connecting roads like Appletree Road on the Croftlands estate which acts as an entry from the main through road to a large residential area.

One way of overcoming the problem of varying road lengths is to use total path length as a measure. Anderson and Tindall[6] employed this, but they used photographs instead of maps so that they were concerned with recognition rather than recall. Maurer and Baxter[7] calculated the area represented by the sketch map, by reference to a standard map, but this ignores gaps in knowledge, and particular streets, especially cul-de-sacs, may be quite unknown to children living in a surrounding area.

Although the correlation between the numbers of roads marked on maps in successive years by the Croftlands intake was significant, it did not reach the reliability that a good intelligence test would achieve. With the passage of a year changes due to learning and maturation would have taken place, as well as the change in circumstances due to the move to the Lower School. Differential use of transport would have affected opportunities for learning, since almost all the children had walked to their junior school, and different patterns of movement associated with out of school activities would also contribute differentially, and there is also the possibility of emotional factors affecting their learning and drawing.

There is then some evidence both for the validity and reliability of this measure, without which it would be presumptious to draw conclusions about behaviour and cognition within the different groups considered. Interpretation of the data from individuals in Chapter VII is somewhat speculative, derived essentially from rather sparse but suggestive data.

Day[8] made measurements of distances from sketch maps and concluded that these were as variable as those estimates yielded by the other three methods he employed. Apparently he either provided a scale or asked the respondent to include a scale on the map. Some of the children at the Lower School were clearly aware of the scaling problem and had marked their maps " Not to scale ". The visual examination showed the frequent use of a larger scale in the home area; to examine this further a scale ratio was calculated, relating the distance between fixed points on the map to the distance on an O.S. map which conveniently included the whole town on A3, the size given to the children.

For the measurement of directions at Croftlands some baseline had to be adopted. Since all the children had marked the school and the swimming bath, and the road joining them is a main road through the estate, the line joining these two locations was used. This was quite arbitrary, and should not have affected the results, but illustrates the problem of tying information on the maps to the real world.

When working over data from an exercise of this sort the researcher gains a 'feel' for it and must choose to display it so that its characteristics are revealed. The decision to count the numbers of boys and girls who named more than half the roads on their maps was

quite arbitrary, but it led to significant differences between the sexes consistently over the three years. Likewise the decision to mark on street maps those roads named by over half the children at each junior school, and by between a quarter and a half, is quite arbitrary but shows the differences between the four groups. The choice of this method is preferred to that of marking the 'top twenty' roads for each school; for the latter would yield only qualitative comparisons, while the former includes a quantitative element. In fact the number of roads named by over half the children was designated a consensus measure. Another aspect of the data was displayed by calculation of the average number of different roads per child, and this was called the idiosyncracy measure. The pattern of these two measures for the four schools was broadly predictable from the characteristics of their intakes.

FINDINGS

In this study of 11 and 12 year olds in Ulverston, the extent of environmental knowing was investigated in relation to both behavioural and cognitive factors. That movement patterns provide an opportunity for such learning, while cognitive factors determine how much and what is learnt, is demonstrated in Fig. 5.1 where number of journeys recorded in the diaries was plotted against numbers of roads on maps. There is a steady increase in the minimum number of roads recorded at each larger journey frequency, but a wide range at each level suggesting that though the more active child cannot fail to pick up some information, some less active children may still retain more.

Sex, socio-economic group and general school attainment were found to be clearly associated with aspects of environmental knowing, as were the mediational factors of mode of transport, attendance at out of school organised activities and junior school attended, all of which have geographical components. The groups distinguished by the mediational factors have characteristic and different compositions in terms of sex, socio-economic group and attainment, and display distinct levels of environmental knowing.

Sex differences

Boys appear to have a consistently wider knowledge, in terms of a higher mean number of roads known, than girls. However boys also showed a wider variability, and the differences between the means for boys and girls were small and did not reach statistical significance. This tendency for girls to score in the middle ranges is well known in intelligence tests and is a characteristic difference between the two sexes.[9]

Girls were found to name more roads on their maps than boys. A general tendency for a greater attention to detail by girls is widely recognised; and noted by Bishop and Foulsham in relation to environmental learning in Harwich.[10]

These two differences cannot be simply explained on the basis of the generally observed greater spatial ability of boys and greater verbal ability of girls, as the boys in fact named more roads in their lists. It seems to represent a difference in overlap or integration between the spatial and verbal schemata which would represent a cognitive difference.

Marked differences in movement patterns by the boys and girls on the Croftlands estate were not demonstrated in the data collected. At the Lower School differences in mode of transport may well have reflected a more general use of bicycles by boys at this age (Anderson and Tindall found that home range for bike-owners was generally higher than for non-bike owners.)[11]

Socio-economic differences

The differences in extent of maps between the children from council and from private housing were very small on the Croftlands estate. This may have been due to the adoption of similar norms for playing out, and walking to school though there were slight differences in attainment and in attendance at organised out of school activities between the two groups. At the Lower School the differences in mean numbers of roads on maps reached significance, though the differences in mean numbers of roads in lists just failed to do so. At the Lower School children from council houses were more widely represented in the lower attainment groups, and there were clear differences in mode of transport. Attendence at out of school activities was representative of both housing groups.

The author has found no mention of socio-economic differences in environmental knowing among children, though Goodchild[12] found it with adults. It seems likely that it is the children from lower attainment groups at school who generally find themselves in the lower socio-economic groups as adults.

Attainment

This was found to relate both to extent (mean numbers of roads on maps and in lists) at the Lower School and detail (named roads on maps)

in all the studies. This implies highly developed spatial and verbal schemata and a high integration of the two, among the more able.

Moore[13] in his recent review of the literature concludes that overall educational level, general intelligence and verbal reasoning are probably not related to cognitive mapping ability, which he sees as related to more specific cognitive abilities such as concrete operations, spatial relations ability, coordination of perspectives and so on.

The author would question this, as although the present results generally relate to the measures of extent of sketch maps, in general the more roads marked on a map the greater its sophistication. The more information involved the more organisation is required to display it.

Also the correlation between numbers of roads on maps and in lists suggests that these represent different aspects of a core of environmental knowledge. In general the lower attaining children had short lists as well as poor maps, though there was considerable variability. The evidence for the association with general school attainment is strong (p<.22). The author is unaware of any other study where general school attainment has been scaled and related to any measure of cognitive mapping in children.

Mediational factors

Where the mode of transport is analysed within each attainment band there is clear evidence for the relative contributions of both behavioural and cognitive factors, see Table 6.5 . The mean numbers of roads for Band A are approximately double those for Band C, and the numbers steadily decrease from those using bicycles, through walking to the lowest values of those who travelled by bus, within each attainment band.

Attendance at out of school organised activities was most frequent and involved more different activities among the higher attainment groups; and these children also had on average a wider knowledge of the town than those who did not join in. This supports Wards[14] assertion about the wider knowledge of the city and use of facilities by those children with a hobby or skill. At Croftlands Junior School there were clear socio-economic differences between the group who were engaged in such activities and those who were not. At the Lower School there was no such clear division, and this may have been due to the older age group as well as to the fact that a very large number of activities were organised on the school premises, and probably therefore more open in membership.

The differences in the extent of the town known by the groups who had attended the four different junior schools were fairly predictable from considerations of the characteristics of their intakes in terms of sex, and in the case of St. Mary's, religious persuasion, and in the effect of socio-economic group which is confounded by the geographical variables. Although the home-school distance has not been shown to have a systematic effect in another study,[15] it seems likely that it did play a part in the higher value of average number of roads for the Croftlands group, and the natural rather wide boundaries of this estate were probably also a contributing factor, together with the generally higher socio-economic group.

Distance and Direction

From the sketch maps it was possible to investigate some aspects of scale and direction. Measurements from the Croftlands 1976 study supported the operation of a distance decay function in relation to

scale with the home as origin, as postulated by Anderson and Tindall.[16] A larger scale for distances based on home as origin also results in a larger area round the home; it is possible that the large areas for the home mentioned by Maurer and Baxter[17] are a reflection of the same phenomenon. The ethnic differences in the area of home noted by them were interpreted as reflecting different attitudes to the home; there have also been suggestions that familiarity leads to larger cognitive representations. With adults, in London, Canter[18] found no evidence to support the systematic effects of preference and familiarity in distance estimates. He concludes that "hypotheses relying on one variable, such as valence, and taking no account of the scale of distances involved can no longer be accepted as tenable in a wide variety of situations". It is unlikely that any of the locations in his study would have such strong feelings associated with them as children hold about their homes and schools, and with the daily journey to school familiarity can be considered a constant. Table 5.2 shows mean scale ratios of distance classified according to distance from home and stated preference for school. There is some evidence for the distance decay function of scale operating, and slight evidence for the systematic effect of preference; the lower mean scale ratio for the highest preference group being anomalous. A similar exercise was carried out in relation to the swimming baths (Table 5.3) and here the evidence for a distance decay function is very slight and for the systematic effect of preference, unconvincing.

It should be emphasised that Canter's results relate to direct distance estimates; whereas the scale ratios in this study derive from maps. Although Day[19] has concluded, with adults, that the choice of technique is not significant, the present writer feels that the effect

of distortions in drawing could well be more widespread among children. This may apply especially to the tendency to squeeze information onto the sheet, thereby affecting measurements made to points near the periphery.

The present study gives considerable evidence for a distance decay function of scale operating with the home as base, for the representation of the known area at age 10-11 year old, but it cannot separate the cognitive from the representational.

Direction was measured from the maps for the visual angle of the Hoad Monument, and the experienced direction of home. Byrne[20] concluded, that a network map, topologically correct, better explains the simplication of angles to right angles that he noted. It would presumably lead to wide errors of direction estimated through a built up environment - unless it could be assumed that for the most direct route over- and under-estimation would cancel out. In fact, the mean errors for the home direction in both these studies were smaller than for the visually observed Hoad Monument. In general, the location of home was embedded in the network of roads they had drawn. The Hoad Monument, though visible from school, was far enough away to be separate from their road network; so that errors might be due to the tying of this perceived direction to elements of their own maps. To the present author, the preservation of a general sense of direction, combined with variable scale ratios, makes a vector map seem more convincing than a network map.

Verbal and Spatial Schemata

The author is unaware of any work examining the location as well as the naming of roads by children. From the individual results, in

Chapter VII, it is clear that maps tended to be joined up to display an integrated whole, while the plotting of road names listed onto street maps revealed the geographically fragmented nature of this information store. It seems likely that the locations of some of the roads listed were not well known, but this could be examined in future work.

The lack of correlation between extent of knowledge displayed in the two schemata by the children who had been to junior school outside Ulverston is some evidence for the independent acquisition of the two schemata, though at this age they were old enough to read the road names where they were clearly visible.

The naming of roads on maps also presents problems of interpretation. The lists of road names generally comprised more roads than were indicated on corresponsing maps; but on average less than half the roads on maps were named, and there were a number of children who named none at all. However, the distributions of named roads were very comparable over the three years, with the lower numbers named by children from the lower attainment group. It has therefore been assumed that this represents a real and systematic cognitive effect relating to the integration between the two schemata. There are other quite plausible explanations, viz. that there was selective attention to the drawing task and the instruction to name was not registered; that there was an attempt to produce something akin to a standard O.S. 1:50000 map which has no names on it - some evidence for this came from the use of standard symbols; or it could be due to the ambiguity of the instruction to draw a bird's eye view, where names would not be visible even if birds could read, for children can be devastating in their own logic.

Conclusions

Because the ratio of named roads to roads marked on maps was considered to represent a real cognitive effect, it was calculated for the four groups of children in Table 6.8 . It is interesting that the high values of this measure does identify the same two groups for whom the independently obtained correlation coefficient (between numbers of roads on maps and in lists) is significant. Such internal consistency of the data would seem to support the validity of the measures adopted.

An alternative measure would be the proportion of roads on the map included in the list, based on locational considerations rather than verbal ones. This could be found by asking the children to locate roads from their lists on blank maps.

The overlap between the road lists of the twin sisters however suggest that these lists represent common movement patterns. Though verbal references to the homes of friends, the use of broadly the same shops, and attendance at the same activities would all also result in a common vocabulary of road names. Clearly they displayed quite different mapping abilities, which seem to correspond with the difference between their attainment bands at school.

Murray and Spencer,[21] on a much larger scale, investigated the effect of geographical mobility (behaviour) and strength of mental imagery (cognitive ability) together with basic graphic ability in the production of sketch maps. They concluded that, at their scale, and with groups with very different mobilities, then the level of mobility was the best predictor of mapping performance. Within the more homogeneous group of children in this study, the cognitive differences clearly assume a greater importance.

FUTURE WORK

Arising from this study there are a number of possible lines of investigation. Recognition measures with children have been used, for instance, as an indicator of activity field; but it is clear that both cognitive and behavioural factors are at work. Further investigation is required to distinguish and compare the cognitive components involved in recognition exercises both with aerial photographs and blank maps, and with the recall exercises of sketch mapping and road lists.

The parallel acquisition of information about the naming and location of roads by young children would be interesting. They are known to be able to recognise aerial photographs, and data from these could be compared with spoken lists of road names, recorded by the researcher. It would be interesting to find out how the children came to know the road names before they are old enough to read them; perhaps there is a marked increase in the length of their lists when they can read.

Problems arising within the present study might have been solved by questionning the children individually, but this is time consuming and difficult to arrange. As it is often not until the research material is examined that specific questions arise, it might be desirable to arrange for return visits in connection with particular research exercises.

If there is to be any attempt to compare quantitatively, data from different studies as well as from different groups, then a more thorough investigation and comparison of the three measures of extent of map is required, viz. number of roads, total path length and areal extent, with some indication of validity and reliability.

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Appendix I

Questionnaire, form for the teachers assessment, cover and page from diary used at Croftlands School in 1976 .

The questionnaire on page 204 was completed by each of the children in the top three classes.

The form for the teachers assessment on page 205 was completed by the teachers for each of the children in the three top classes in the school.

The cover of the diary (reproduced at half size on page 206) gives the instructions to remind the children how they were to complete the entries. The inner page from the diary (reproduced at half size on page 207) illustrates one of those to be completed on weekdays at school each morning, by each of the children, during the week July 5th - 12th 1976.

MB/P11 6/76

Name .....

Please underline your answer here

1. Do you like going out and about? Yes/Sometimes/No

2. In your free time after school do you mostly play out by yourself/play out with other children/play out with your family/stay home?

3. In your free time at weekends do you mostly go out and about by yourself/go out and about with other children/go out and about with your family/stay home?

4. Do you go shopping for your family or other grown-ups? Yes/No

5. Does your Mother or Father have a car or van? Yes/No

6. Do you have a bicycle? Yes/No

7. If you go out to play after school do you tell a grown-up <u>where</u> you are going? Yes/Sometimes/No

8. If you go out and about to play at weekends do you tell a grown-up where you are going? Yes/Sometimes/No

9. At about what time to you go to bed? 7 8 9 10 11 12

10. How do you go to school? Walk/bus/bicycle/car

11. How do you go home from school? Walk/bus/bicycle/car

12. Please give names and ages of your brothers and sisters, if any.

Name	Age	Name	Age
.....	....	.....	....
.....	....	.....	....
.....	....	.....	....
.....	....	.....	....

THANK YOU

MB/P10 6/76 CONFIDENTIAL

Pilot survey, to be completed by teacher, comments welcomed.

Name of Child ..... Date of birth

Address of Child ....

..... Girl/Boy

Please ring the appropriate position on the scale, making full use of the range.

	very	quite	neither/nor	quite	very	
Observant	1	2	3	4	5	Unobservant
Confident	1	2	3	4	5	Timid
Participating	1	2	3	4	5	Solitary
Physically active	1	2	3	4	5	Inactive
Dull	1	2	3	4	5	Bright
Good general attainment	1	2	3	4	5	Poor general attainment

THANK YOU

Name .....

O U T A N D A B O U T D I A R Y F O R W E E K

Date started ..... Date ended .....

Please begin a new page of the Diary each day, notice that the pages for Saturday and Sunday are a little different. Please draw a ring round the day.

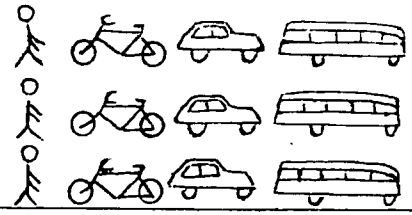
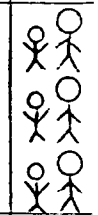
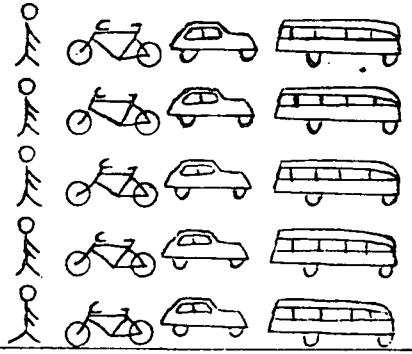
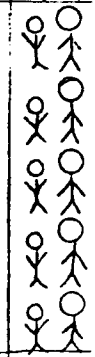
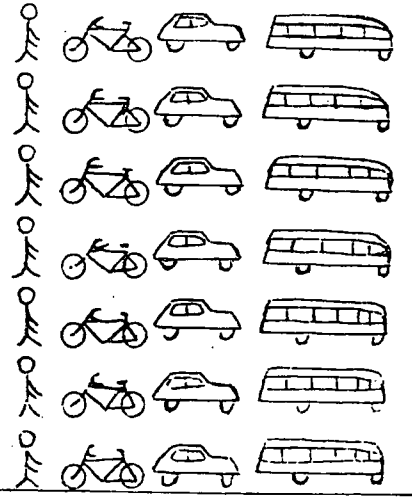
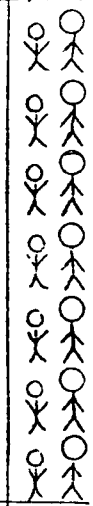
The questions to be answered are :-

1. WHERE ? Please fill in the names or addresses of the places where you went.

2. HOW ? Please show how you went to each place by drawing a ring round a person for walking, or round a bicycle, car or bus.

3. WHY ? Please write what you did at each place in the 'Why' column.

4. WHO WITH ? Show if you were alone or with other children by drawing a ring round the child in the last column. If you were with any grown-ups draw a ring round the grown-up in the last column.

When	How	Where	Why	With
Before School				
After School before Tea				
After tea before bed				
	MONDAY TUESDAY	WEDNESDAY THURSDAY FRIDAY		

Appendix II

Questionnaire used at Croftlands School in 1977

The questionnaire on page 209 was completed by each of the children in the top three classes.

ME/20 Croftlands 1977

Name ..... Please underline your answer here

1. How do you go to school? Walk/bus/bicycle/car

   Do you go alone/with friends

2. When you go out to play after school do you tell a grown-up <u>where</u> you are going?

   Yes/mostly/sometimes/not often/no

3. When you go out to play at the weekends do you tell a grown-up <u>where</u> you are going?

   Yes/mostly/sometimes/not often/no

4. Do you like going swimming at the baths?

   very much/quite/don't mind/not much/no

5. If you could choose, would you come to school?

   Every schoolday/most schooldays/sometimes/not often/no

6. How do you usually go into town? Walk/bus/bicycle/car

7. Along which road into town do you usually go?

   .....

8. Can you see the Hoad Memorial from home? Yes/no

9. Do you go to the Hoad Memorial?

   Very often/often/sometimes/not often/never

10. Can you think where you might be this time next year? Yes/no

11. If you can, where do you think you might be?

    .....

THANK YOU

Appendix III

Questionnaires used at the Victoria High School Lower School, in 1978

The questionnaires on page 211 and page 212 were completed in successive weeks by each of the children in the first year classes.

MB/22 ULCS 1977

NAME.....Please underline your answer here

1. When you come to school, do you come? alone/ with friends

2. When you go home from school, are you ? alone/ with friends

3. Do you like going swimming at the Baths ?

Very much/ quite/ don't mind/ not much/ no

4. Did you like your Junior School ?

Very much/ quite/ don't mind/ not much/ no

5. Which way do you go home, along which road ?

.....

6. Where is halfway from school to home ?

.....

.....

.....

7. Did you visit any relatives last week ? Yes / No

8. If yes, how did you go to see them ? Walk/ bus/ bicycle/ car

9. Do you think you remember where you were at this time last year? Yes/ No

10. If Yes, where was that?

.....

.....

.....

THANK YOU

Name..... Please underline your answer here

1. How do you come to school? Walk/bus/bicycle/car

2. How do you go home from school? Walk/bus/bicycle/car

3. When you go out after school do you tell a grown-up <u>where</u> you are going? Yes/mostly/sometimes/not often/no

4. When you go out at weekends do you tell a grown-up where you are going? Yes/mostly/sometimes/not often/no

5 If you could choose, would you come to school? Every schoolday/most schooldays/ sometimes/not often/no

6. Can you see the Hoad Monument from home? Yes/no

7. By which road do you come into town?

.....

8. Do you attend any regular out-of-school activities? If so please give names and places

Name of activity	Place
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

9. <u>Where</u> is halfway from your home to school?

.....

.....

.....

THANK YOU

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