

HONG KONG CHILDREN'S UNDERSTANDING AND EXPERIENCE OF MAPWORK TASKS
PRIOR THEIR FORMAL MAP LEARNING IN SCHOOL

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1. Introduction

One of the main aims of geographical education is to help students to master appropriate skills to think critically, analytically and to process incoming data systematically via different media of communication such as maps. Mapwork in geography is seen as a basic life skill for school children to acquire. Its importance is reflected in the frequent daily encountering and use of maps to solve problems, e.g. finding the way in the shopping centre, deciding the route for a family outing and locating places. Such problem solving behaviour, utilizing maps as the tool, by children is of great significance as it reflects the capacity of human minds to function and it has become one of the foci of modern education.

Psychological research on how children think to learn and solve problem is quite fruitful in mathematics and science education (Anamuah-Mensah, 1986; Greeno, 1978; Larkin, 1981; Roth, 1990, and Schoenfeld, 1994). However, it is almost an untouched area in social science education. In particular this study which explores how Hong Kong children, aged 10-11, handled and processed map evidence when they were presented with maps of their home locality, is at the cutting edge of the research in this area. *Children's thinking is reflected in the way that they go about reading and utilizing the map information, retrieving existing locational knowledge, and relating both to make meaning out from the abstract map information in order to locate familiar and unfamiliar places on the maps.*

The learning and teaching of maps in Hong Kong are only dealt with formally in the secondary school curriculum (where the pupils age is generally 13+) and in particular, mainly in the subjects of geography and social studies. Maps are used sparsely in primary schools to illustrate mainly continental or country locations. Kwan (1988) found that Hong Kong geography teachers perceived their students' unsatisfactory performance in mapwork and they found that teaching mapwork in school via the subjects was obscured because of the absence of explicit instructions of how to teach it. Hence, some teachers maintained a conventional way of teaching basic mapwork in a block, lasting for about two months, at the beginning of the secondary one geography curriculum with the emphasis of maps as a topic within the curriculum. Some teachers chose to teach mapwork on a regular basis, i.e. they included a map lesson every week throughout the year. Some chose to ignore and did not do any mapwork with the students. No matter which pattern the teachers adopted, there was no clear emphasis that maps are used as a tool of spatial information and to find one's way in both familiar or familiar environment. The teaching of mapwork tends to be abstract, hypothetical, discrete and irrelevant that students find them difficult to relate what they have learnt to the everyday situation. As a result, teacher complained the poor map performance of the students while the students have lost interest to pursue maps and consider it a difficult topic in the geography syllabus.

This paper reports an explorative case study of how three Hong Kong children (aged 10-11) worked with maps of their home environment to locate places. They were able to infer simple meanings from map symbols and attain a basic understanding of map concepts if maps of their familiar home environment were presented to them in a realistic, practical and lively manner, even before they formally encountered map learning in school.

2. Aims and the Key Questions

Two aims have been identified in this study. They were:

- i) to understand the children's view, understanding and experience of mapwork before their formal map learning begins at the junior secondary level in Hong Kong schools, and
- ii) to describe qualitatively the children's thought processes as reflected in their locational behaviours in their home environment using a large-scale (1:1000) cadastral map.

The locational tasks presented to the children were structured around the following key questions:

- i) How did the children make meaning out of the map?
- ii) How did the children exercise thinking in handling the abstract map evidence?
- iii) How did the children make locational decisions on the map?

3. Methods

Case study as an important relevant research approach was used to investigate this empirical topic. Yin (1989) and Stake (1994) see case study as a powerful research strategy used to illuminate a decision on the "how and why" questions especially if the researcher did not intend to control the events and when the focus is on a phenomenon within a real-life context such as the case of how the children extract and use map information in their daily lives. It is an approach used to capture the close-up, holistic and detailed observation of how the children process and make sense of the embedded map information to perform a meaningful use of the maps in their daily life situations.

Since this qualitative case study was based on the children's home environment, there is no need to engage in sampling techniques that are normally associated with experimental study designs. Three children, of aged 10 to 11 in their final stage of primary education, were invited through recommendation by teachers to participate in a year long study. Consent for their participation was obtained from them and their parents. The study was conducted in each of the children's home context as they worked on maps of their nearby locality. They were given a cadastral map of their home environment at the scale of 1:1000 to locate familiar and less familiar places both near and further away from their home. They were encouraged to talk aloud to elicit how they have worked with the map information in order to capture their thinking and cognitive understanding of maps before a locational decision was made. Particular reference was made to two key map concepts, namely scale and symbolization (Boardman, 1983; Catling, 1979; and Mills, 1985). The conversational interview with each of the children was conducted in a phenomenological way as illustrated by Kvale (1983) that enabled the children to describe their thinking and reasoning in as much detail as possible and the interviews were audio-recorded and subsequently transcribed verbatim for interpretation and the development of the children's conceptual approaches of locational search using the method for phenomenographic analysis as defined by Marton & Saljo (1984) and Dahlgren & Fallsberg (1991).

This poster reports the behavioural characteristics and locational approaches used by the three children in working with the given map over the year long study. The nature of this case study is an exploratory one because there is limited knowledge about map understanding of the Hong Kong children prior to secondary education. Any indepth result about how each child had performed to reflect his/her map understanding and experience was regarded an important revelation to the current 'black-box' situation.

4. The mapwork tasks

The children were each given a 1:1000 cadastral map of their home area and were asked to locate:

- i) familiar places, such as a supermarket, a church, a post office and a school that are located

- very close to their home; and
- ii) less familiar places, such as the park, the restaurant, the bank and other landmarks that are located further away from their home.

5. Results

The results reveal that despite the three children not having begun their formal map learning lessons in geography in the Hong Kong secondary schools, they were able to demonstrate the ability to utilize the maps to perform the tasks that were contextually familiar and related to their living environment, although at different levels of competence and confidence which were related to: i) the preferential intake of the map information, ii) the amount of locational knowledge that they have on their home area, and iii) their level of cognitive learning.

The preferential intake of map information (Boardman, 1985; Gerber, 1979 and Wilson, 1980), is about the child's sensitivity to textual or symbolic information on maps. Textual information appears in the form of labels of place and street names. In the cultural environment of Hong Kong, such labelling can either be in Chinese and/or English. Symbolic information refers to abstract signs or pictorial drawings with further information denoted by shape and size.

The locational knowledge (Matthews, 1992; Spencer *et al.*, 1989) refers to the familiarity of their home environment on the various details about the landmarks and features that are recognised, remembered and stored in the children's memory for use as guiding reference in the locational search. Apart from having such locational knowledge of various features in mind, the way they are related to form a mental pattern is also critical in deciding the use of a locational approach.

The level of cognitive learning refers to how a child can exercise his/her ability to work with how many pieces of information at one time and whether the child can relate the pieces of information together. Biggs (1987) and Biggs and Collis (1982) state in the SOLO taxonomy that cognitive learning takes place as prestructural, unistructural, multistructural, relational and extended abstract.

With regard to these three criteria of competence and confidence, three qualitatively different locational approaches of handling map information were identified with each approach dominated by some salient behavioural characteristics. Each child adopted one approach to handling map information. However, each child also demonstrated the occasional behavioural characteristics that were found in the other approaches apart from his/her dominant one. The three different approaches are: i) the rote memorized pattern of operation, ii) the structural sequential pattern of operation and iii) the concurrent pattern of operation that they progress in the level of complexity and accuracy in the locational decision outcome.

5.1 The locational approach of a rote memorized pattern of operation

Figure 1 shows the pattern of rote memorized operation in the location of familiar places near and further away from home base using the 1:1000 cadastral map. This approach is characterised by the following behaviours. The child:

- i) relied heavily on a "recalled mind-walking" strategy that he/she imagined walking away from home and recalled some of the features that he/she would encounter on the way of his/her imaginary walking. This mental walking behaviour relied very much on the existing locational knowledge that a child remembers about his/her home environment.
- ii) compared and matched his/her recalled locational knowledge of landmarks and features (such as traffic light, bus stop, zebra crossing etc) that he/she encountered with the map information.

- iii) was more sensitive to textual information in the form of place name labels but were rather indifferent to the symbolic information on map.
- iv) was seen to be scanning around the map area with a sporadic eye movement indicating the inability to match the rote memory with the map information.

Despite relying heavily on rote memorization with incomplete locational knowledge of their home environment and an indifference to symbolic map information, the child was able to focus on one piece of textual information (usually it was the label of a district name) and relate it to the locational memory. However, an inconsistent outcome was noted with an approximate or inaccurate locational decision due to the child's short-term rote memorization.

5.2 The locational approach of a structural sequential pattern of operation

Figure 2 shows the pattern of structural sequential operation in the location of familiar places near and further away from home using the 1:1000 cadastral map. This approach is characterised by the following behavioural characteristics:

- i) "mind-walking" starting from home to the familiar place nearby. Though implicit, the child had distance in his/her mind that such a relatively short distance allowed him/her to "mind-walk" the whole route in order to reach the target place; or
- ii) "mind-jumping" from home to a nearby familiar landmark which was then used as a new reference base to start his/her "mind-walking" strategy to reach the target location.
- iii) looking for other referencing features from the memory of his/her locational environment. However, the child had a strong preference to select textual information, in particular the Chinese labels that first matched his/her memory.
- iv) trying to make a general and correct decision. If this was not possible, hesitation in the form of "mind-wandering" around a general adjacent location would occur.
- v) seeking more information from the map to improve his/her locational decision. The child would turn to symbolic information, such as the size and shape of the signs and relate them according to his/her mental recalled experience.
- vi) arriving a final correct and precise location.

The child used this pattern was notified of the regular operation of the characteristic in sequence. If places were located further away from home, there was more chance for "mind-jumping" to a nearby landmark, e.g. a main street, signified by labels, the child would then proceed to "mind-walking" to the target place. When hesitation and confusion occurred and precise location could not be made, the child would seek more symbolic information to help with at least an approximate location. The conversations recorded also reflected the child's elementary understanding of straight line distances as compared to crooked distances, the accurate distance measurement with reference to the use of a proportionate ratio as compared to rough distance estimation. The child also appeared to be more sensitive towards textual information on map than the symbolic information. However, when the child was put into a situation that labels were not sufficient to help with decision-making, he/she would revert to using symbolic information more successfully. When the child came across unfamiliar symbols on the map, he/she could guess the meaning by relating to his/her mental experience of the locational knowledge. With hints given, the child was able to obtain assistance from the map legend to obtain such symbolic interpretation. With all these textual and symbolic information in mind, the child was able to relate two or three pieces of information sequentially to enable the making of an approximate to quite precise locational decision.

5.3 The locational approach of a concurrent pattern of operation

Figure 3 shows the pattern of concurrent operation in the location of familiar places near and further away from home using the 1:1000 cadastral map. This approach is characterised by the following behavioural characteristics:

- i) a complete and thorough knowledge of his/her own home environment and could arrange and relate landmark features and streets to form a spatial pattern in mind.
- ii) retrieve such information and use them as reference points to match with the map information.
- iii) perform more "mind-jumping" strategies from home to the referential point or even to the target location.
- iv) show sensitivity to symbolic map information rather than the textual information.
- v) make a quick and precise locational decision and give sound justification for his/her decision.

The short time that a child could come up with a precise location indicated that he/she operated a few steps simultaneously and the thorough locational knowledge helped greatly to enhance such quick decision-making. The child was also seen to be capable of relating multiple pieces of map and memory information to form a clear mental spatial image to enhance such a decision. The child used maps as often as possible to locate a new place he/she had never been to before. Parental influence and family support in the form of provision of atlas and map books for the child to use readily at home provided an excellent chance for the child to use maps through self experience and mental image matching. Even abstract symbolic information became meaningful to the child through such realistic and comparable matching and through reading from the map legend. Route walking decisions were often made with the prime consideration given to the shortest distance and the ease to walk such a route. The latter required that a child understood the map environment of walking up or down hill. Such knowledge was obtained from both the map information and from self-acquired locational knowledge.

6. Implications

Through various level of performance, the three children demonstrated the capability to utilize maps and work with some or most of their existing knowledge about the environment to interpret maps before their formal map learning lessons began in secondary school. The findings have indicated that the Hong Kong geography teachers had underestimated the learning capability of the students to use and understand maps. It was revealed that the use of maps that have direct relevance to the children help them to solve locational problems and to find their way in both familiar and unfamiliar environments so that they would be in a better position to retrieve from their memory the locational knowledge, utilize, compare, associate and relate it to the map information in order to make a reasonable decision. By so doing, they did not see maps as abstract, sophisticated and unrealistic. Instead they would appreciate the application of maps in the everyday situation.

It is hence suggested to the geography teachers, not necessarily confined to those in Hong Kong, that maps have to be taught in a lively integrated manner, emphasizing the existing locational knowledge that the children possess by the time when they begin their formal map lessons in geography. The conventional way of teaching maps in a block or one lesson a week in a regular pattern, without the attempt to integrate maps into the geography curriculum, and the often use of the hypothetical maps to illustrate the abstract map concepts such as location, direction, scale, contours and symbolization would only suffocate the interest of the children to pursue and develop mapping skills further. On the other hand, the children are map-users of various degree of capability even before formal map lessons begin.

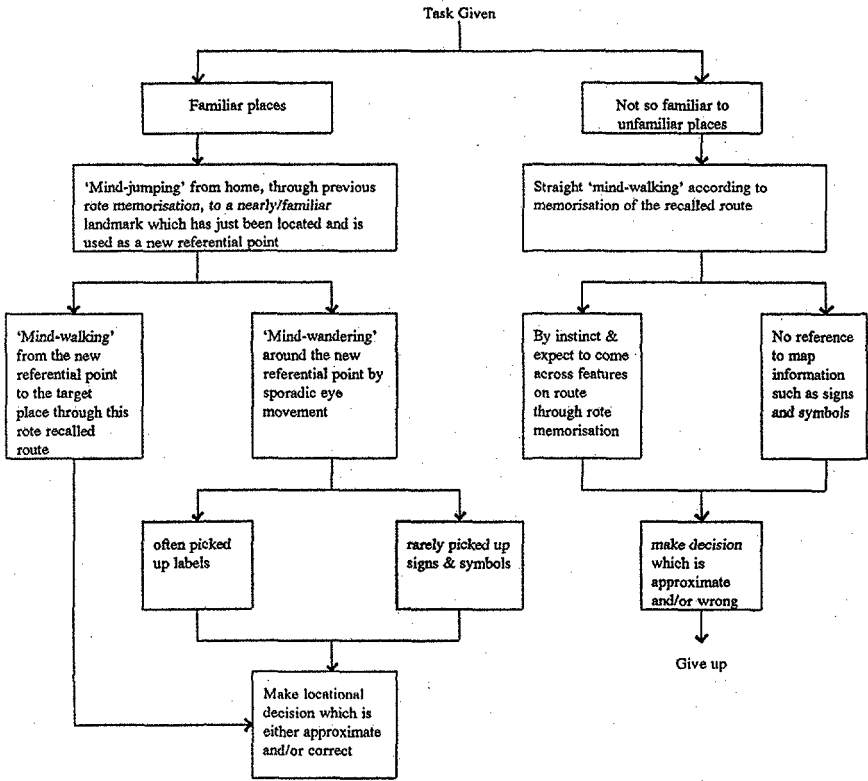


Figure 1 The Locational Approach of a Rote Memorised Pattern of Operation

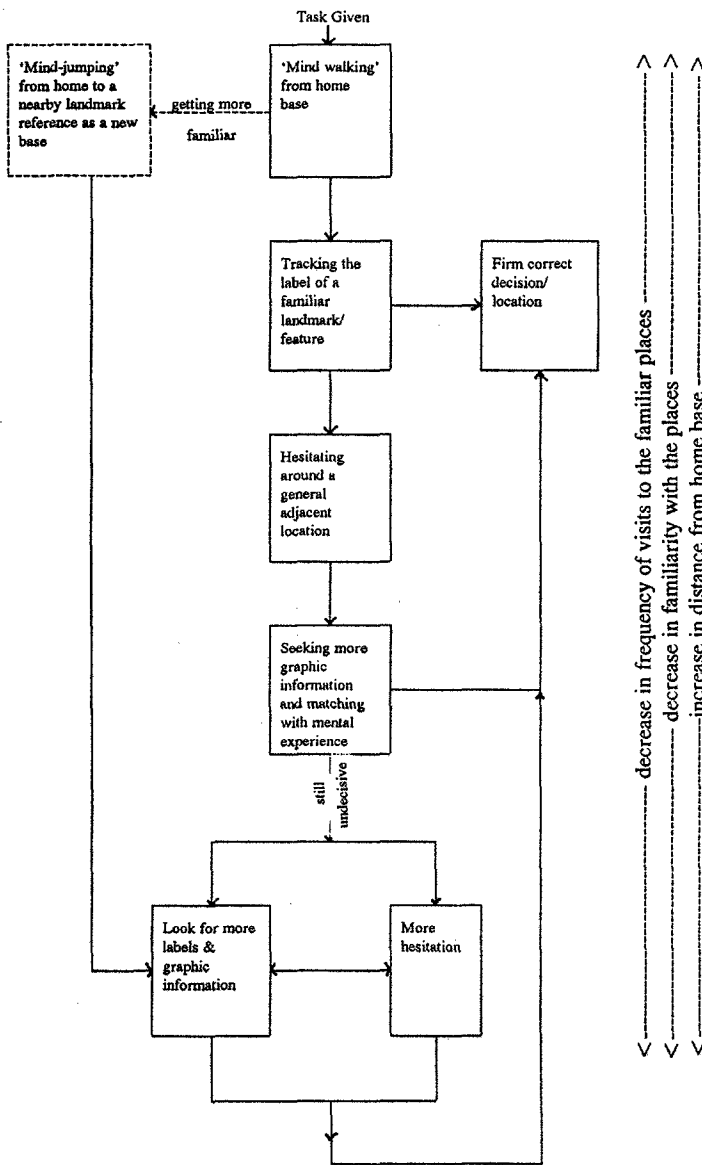


Figure 2: The Locational Approach of a Structural Sequential Pattern of Operation

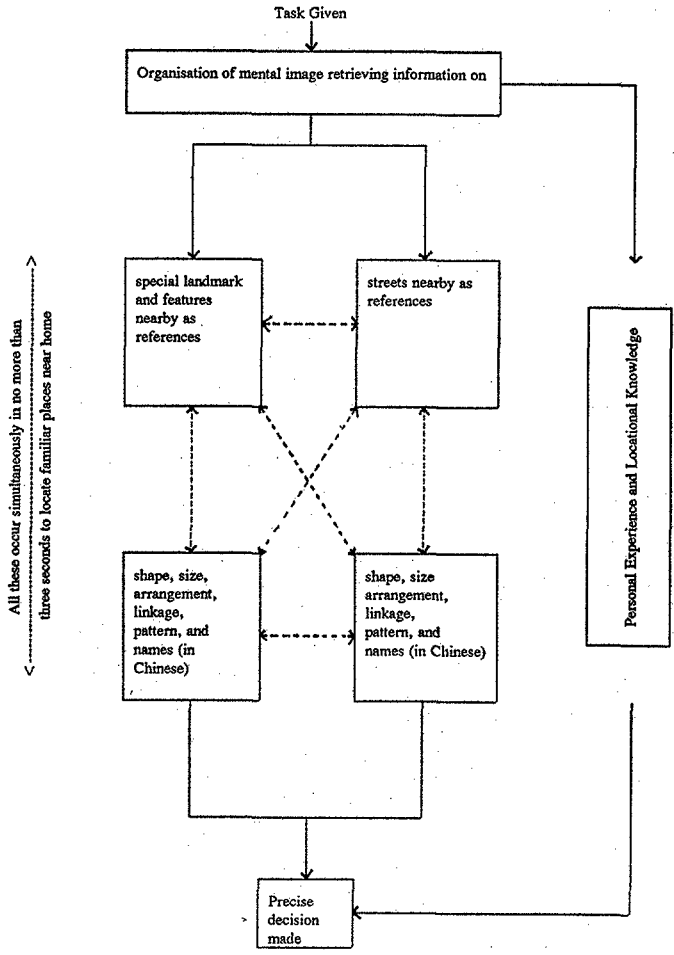


Figure 3 The Locational Approach of a Concurrent Pattern of Operation

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