

Selection of Extracurricular Education Facilities and Organizational Performance Analysis of Meg-city Spatial System

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Abstract—With the rapid expansion of city scale and the excessive concentration of population, achieving relative equality of extracurricular education resources and improving spatial service performance of relevant facilities become necessary arduous tasks. In urban space, extracurricular education facilities should offer better service to its targeted area and promote the equality and efficiency of education, which is accomplished by the allocation of facilities. Based on questionnaire and survey for local students in Hangzhou City in 2009, this study classifies extracurricular education facilities in meg-city and defines the equalization of these facilities. Then it is suggested to establish extracurricular education facilities system according to the development level of city and demands of local students, and to introduce a spatial analysis method into urban planning through the aspects of spatial distribution, travel cost and spatial service scope. Finally, the practice of nine sub-districts of Hangzhou is studied.

Keywords—extracurricular education facilities, equalization, spatial service performance, meg-city

I. INTRODUCTION

EXTRACURRICULAR education is a series of meaningful, planned and organized educational activities, which are beyond students' study plans and course standards during their spare time [1]-[3]. With the development of primary education, the selection of extracurricular education is a common phenomenon for kindergarten children and elementary school children [4], [5]. Many scholars, observing the phenomenon [3], [6]-[9], have focused on concepts, features, functions, patterns and management of extracurricular education (including foreign experiences) in recent years [10]-[15]. Overall, however, problems of urban space caused by extracurricular education activities haven't received a lot of publicity in related documents.

With the rapid expansion of city scale and the excessive concentration of population, once extracurricular education has developed into a normal family activity, space allocation of related facilities and resources becomes a planning problem needed to be studied. Not only does it involve matters of spatial arrangement, but also organizational performance of

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meg-city's spatial system and related social costs and social equality. Based on the study of nine sub-districts of Hangzhou City, the main steps of analysis are drawn as follows: 1) investigation to selection of extracurricular education; 2) analysis on spatial factors of extracurricular education facilities and realization patterns of travel; 3) further discussion on spatial planning and policy recommendations of extracurricular education facilities.

II. CASE AND DATA

A. Case area

Hangzhou City with a population of 5,000,000 has covered 3068km². Many extracurricular education facilities gather in the area. Increase in selection rate of extracurricular education facilities makes higher spatial service costs in meg-city.

Nine sub-districts of Hangzhou are chosen for study on selection of extracurricular education facilities and spatial organizational performance of met-city. According to urban spatial development and the administrative boundary, the case area is divided into four districts: new urban district, old urban district, inner suburban district and outer suburban district (Fig.1). And extracurricular education facilities are mainly in urban districts. Meanwhile they are less in suburbs.

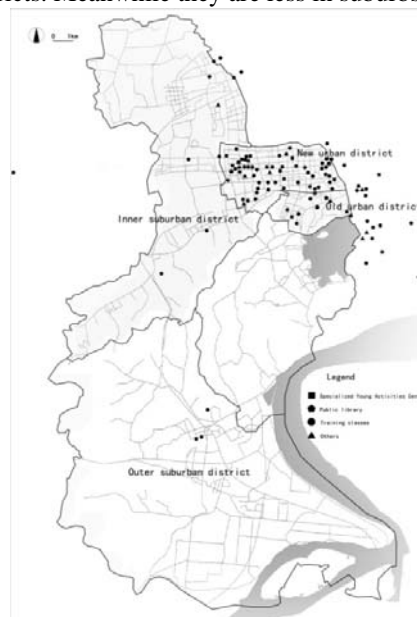


Fig. 1 Extracurricular education facilities in four districts

B. Data

Data which is from survey on extracurricular education facilities in nine sub-districts of Hangzhou City in 2009, is provided by 16 kindergartens and 16 primary schools. 1860 questionnaires are sent out and 1667 available questionnaires are retrieved (Table I).

TABLE I
QUESTIONNAIRES

| Districts | Questionnaires | Available questionnaires | Response rate | Sample number | |
|----------------|-------------------------|--------------------------|---------------|---------------|----|
| kindergarten | Overall | 734 | 729 | 99.3% | 16 |
| | Old urban district | 105 | 104 | - | 2 |
| | New urban district | 279 | 277 | - | 9 |
| | Inner suburban district | 210 | 209 | - | 3 |
| | Outer suburban district | 140 | 139 | - | 2 |
| Primary school | Overall | 956 | 938 | 98.1% | 16 |
| | Old urban district | 87 | 85 | - | 1 |
| | New urban district | 460 | 451 | - | 7 |
| | Inner suburban district | 266 | 261 | - | 6 |
| | Outer suburban district | 143 | 141 | - | 2 |

● Individual property

Survey figures show that the mean age of the respondents is between 31 and 40 years old. 43% of them receive higher education degree. And more than 80% of them are in –service employees, such as normal employees, middle level administrators and SOHO. They work eight hours in a day (Table 2).

● Family property

Survey figures show that the group is dominated by nuclear family. Overall level of family income stays higher. And the proportion of families which have 100,000 yearly income is at least 50%. 59.7% of respondents have their own cars (Table II).

III. SELECTION OF EXTRACURRICULAR EDUCATION FACILITIES AND SPATIAL ORGANIZATION FORM

A. Selection of extracurricular education facilities

The selection of extracurricular education becomes a common phenomenon, and related facilities centered in urban areas. The results indicate that: the grade difference of selection rate is significant in the extreme, the trend is the rate increased with grade, 40% for kindergarten children, more than 60% for primary school students (Fig.2.). However, lack of extracurricular education facilities and imbalance among space disposition of related resources become an issue.

TABLE II
INDIVIDUAL PROPERTY AND FAMILY PROPERTY

| | Frequency | Rate | | Frequency | Rate |
|---|-----------|-------|--------------------------------|-----------|-------|
| The number of persons in the family (person) | | | Car ownership (vehicle) | | |
| 2 | 25 | 1.5% | 0 | 672 | 40.3% |
| 3 | 889 | 53.3% | 1 | 823 | 49.4% |
| 4 | 347 | 20.8% | ≥ 2 | 172 | 10.3% |
| 5 | 290 | 17.4% | Work hours | | |
| ≥ 6 | 117 | 7.0% | an eight-hour working | 890 | 53.4% |
| The number of employers in the family (person) | | | Take shift work | 103 | 6.2% |
| 0 | 8 | 0.5% | Work overtime | 308 | 18.5% |
| 1 | 227 | 13.6% | not precisely | 365 | 21.9% |
| ≥ 2 | 1432 | 85.9% | Position | | |
| Annual family income | | | employer | 723 | 43.4% |
| >60,000 | 235 | 14.1% | middle level administrator | 395 | 23.7% |
| 60,000-100,000 | 398 | 23.9% | Top management | 155 | 9.3% |
| ≥ 100,000 | 698 | 41.9% | SOHO | 258 | 15.5% |
| Education degree | | | Other positions | 135 | 8.1% |
| Associate degree | 955 | 57.3% | | | |
| Bachelor degree | 543 | 32.6% | | | |
| Master degree | 168 | 10.1% | | | |

The selection rate of extracurricular education facilities is significantly different between different districts, and the rate of old urban district is the highest (Fig.3.). The situation that limited extracurricular education resources concentrate in a single area is affected by urban form and traffic modes [16]. That is to say, extracurricular education facilities are welcomed in urban districts because of high-grade facilities, perfect deployment of educational resources and high cost performance, such as public library and specialized Young Activities Center. With the development of service industry, accessibility of transportation and well-equipped facilities, similar facilities gather together in urban districts, such as training classes.

Public library and Young Activities Center are often used to be extracurricular education facilities by both kindergarten and primary school children. Due to the lack of related facilities and users' negative attitude towards extracurricular education of school, 75% of extracurricular education service is from facilities outside the school. According to types of extracurricular education facilities, the rate of associated community facilities and public libraries is rather low. The ratio of facilities type, specialized Young Activities Center/community facilities and public libraries is 6:3:1.

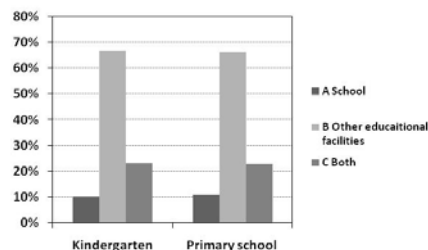


Fig.2 Overall selection rate

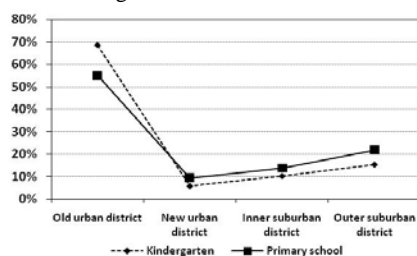


Fig. 3 Selection rate in different districts

B. Spatial organization form of extracurricular education facilities

In general, most extracurricular education facilities center in urban districts, while respondents who choose these facilities are in both urban and suburban districts. This situation cause low effect of commute and high costs in both specialized point and urban space.

● Use frequency

Use frequency of extracurricular education facilities is higher than that in primary school. Specifically, use frequency is from one to twice a week, and using time is on the weekend and holidays. But the regular use leads to heavy traffic in different time periods, obvious change of load, especially in the class interval and the rush hour. That is to say, it creates the bottle-neck in specialized urban space

● Traffic mode

Based on the survey, two types of travel characteristics exhibit mixed traffic mode with the automotive vehicle as the dominant factor. It has the following features:

Feature 1: Due to parents' dropping off and picking up children, the use frequency of walking, bike, EV (electric vehicle), bus and car (private car and taxi included) occupy 8.3%, 10.4%, 22.0%, 15.5%, 43.2%, respectively. Overall, main traffic mode includes: car, bus and electric vehicles, which accounts for 80.8% (Fig.4.).

Feature 2: Due to children's walking to and from school alone, the use frequency of walking, bike, electric vehicle, bus, car (private car and taxi included) and others occupy 31.2%, 12.8%, 12.0%, 38.6% and 5.4%. The result shows that walking and bus are the main traffic mode, which accounts for 69.8% (Fig.4.).

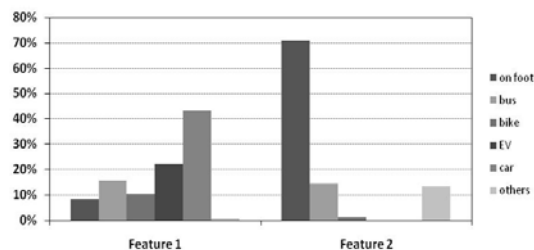


Fig. 4 Traffic mode

● Distance

The main value of commuting to and from school is 20.2min, which are concentrated in 30min. 30%-40% of respondents choose 15min, while 35%-45% of them choose 15min-30min. Average distance is 5.75 km. This includes: 10km 83.5%, 5km-10km 22.9%, 3km-5km 20.4%, 0km-3km 40.2%.

Every traffic mode has clear division of function, and different traffic modes are suitable to different distances (Table 3).

TABLE III
 AVERAGE DISTANCE OF DIFFERENT TRAFFIC MODES (KM)

| | Walking | Bike | EV | Car | Bus |
|----------------|---------|------|------|------|------|
| Kindergarten | 2.02 | 6.41 | 3.87 | 9.85 | 6.65 |
| Primary school | 2.40 | 3.02 | 4.07 | 6.06 | 5.48 |
| Overall | 2.29 | 4.36 | 4.37 | 6.65 | - |

IV. THE CLASSIFYING METHOD OF EXTRACURRICULAR EDUCATION FACILITIES AND ANALYSIS

According to types of facilities, one is specialized Young Activities Center, the other is public library, another is community facilities (Table 4). Now Young Activities Center and public library which depend on public investment can form scale economy and professional services as listed below:

TABLE IV
 DIFFERENT FACILITIES IN XIHU DISTRICT, HANGZHOU

| Name | Floor area (m ²) | Building area (m ²) | Labor power (p) | Classrooms quantity |
|--|------------------------------|---------------------------------|-----------------|---------------------|
| Young Activities Centre | | | | |
| Xihu Children's Palace | 2335 | 7665 | 14 | 26 |
| Xihu Branch Children's Palace Hangzhou | 8004 | 8807 | 9 | 22 |
| Young Activities Centre | 36630 | 41200 | - | - |
| Public library | | | | |
| Zhejiang Library Hangzhou | - | 49000 | 207 | 42 |
| Juvenile Library | 8402 | 5482 | 38 | 20 |

A. Specialized Young Activities Centre

Xihu Children's Palace and Hangzhou Young Activities Centre are the main choices. Level of related facilities is the key factor as well as variety of service, cost of service and transport facilities. These facilities are open besides Young Activities

Center's holiday. There exists the phenomenon that suburban students go too far away to receive extracurricular education because of the spatial scope of services.

B. Public library

Community library and nearby bookstore are the top choice. The use frequency of public library is within 6 times a week, and using time is flexible. Though quality public library is limited in resources and concentrated in space, respondents prefer nearby facilities which is different from specialized Young Activities Center.

C. Community facilities

Some respondents choose community facilities, with training classes as the main kind of facilities from. They often take classes from Monday to Friday. In space, these facilities are large in number and close in positioning, and gain advantages in accessibility and convenience.

V. CONCLUSIONS AND POLICY RECOMMENDATIONS

In short, with the development of Hangzhou City, extracurricular education facilities are unbalanced in distribution, low-quality in convenience and high in the commuter costs. Both the spatial quality of extracurricular education facilities and bottle-neck in urban space influence the equality of the education. Based on the conclusion, the policy recommendations are as follows:

- Coordination of sustainability for urban development and the distribution of resources

Particular way is to improve the conditions of distribution of facilities in suburban districts, which needs to get beyond the restriction of traditional ideas and old allocation patterns of benefits. And then it is to achieve balanced development among extracurricular education facilities and road construction by urban planning management.

- Most optimum distribution of extracurricular education facilities

Considering the actuality and the situation, it is important to increase cooperation between schools, community facilities and public facilities. Realization of educational resources sharing is through schools and the society.

- Optimize the traffic system with the expansion of service scope

In the context of extracurricular education facilities network, we should set up the new school bus link and improve public bicycle system to avoid the low efficiency in suburban districts. For spatial service scope of extracurricular education facilities is large, it is necessary to improve the convenience and safety.

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