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Investigation Regarding Optimizationand Improvements of Natural Education in Urban Parks in Post-epidemic Era —Based on the City Parks of Beijing, Chongqing and Lanzhou

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Abstract:

At the meantime, the global spread of cornovirus-2019 reveals the urgency of public security education, it propel all fields' rethink and patch actions on prioritization during post-epidemic era concerning ecological chain, educational chain and urban governance efficiency etc. As significant urban public resources, city parks must merge green lung function and educational function adequately on the precondition of finite resources, so as to promise diversity and resistance to disasters to help improve the quality of cities. Nevertheless, according to task group's investigation and TOPSIS assessment of entropy weight on city parks in main urban areas of Beijing, Chongqing and Lanzhou, it's discovered that the function of parks regarding natural education performs seriously inadequately. It's imperative to combine epidemic prevention with the fact of frequently happening natural disasters, making better prioritization and improvement of point, line, surface and system on functions and installations, forms and contents, families in concert with campus, interacting multidimensional scientific educational system with green venation, cultural venation andscientific venation merged with each other, so as to promote the real integration of cities and urban parks, and comprehensively enhance citizens' natural, humanistic and scientific literacy.

Keywords: *Post-epidemic era, City parks, Natural education, Strategies for Prioritization.*

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I. INTRODUCTION

The global spread of cornovirus-2019 deepens rethink of a series of issues concerning humans and nature, public security education etc, impelling the series of patch actions duringpost-epidemic era more profoundly: the optimization of ecological chain, education chain and urban governance efficiency [1]. As a public resource connecting human beings and nature in the city, city parks take the role of the most intuitive, diversified, convenient and people-friendly carriers of natural education.In the process of improving environment and preventing disasters, the parks should also give full play to their ecological environment education function, that is, the healer of human "natural deficiency syndrome" and the co-existence and co-prosperity of human and nature and the sharing of "intergenerational adhesive". When nourishing people's green lungs and mood, they must give full play to the ecological environment education ambassador function of the healer of human "natural deficiency syndrome" and the co-existence and co-prosperity of human and nature and the sharing of "intergenerational adhesive". For this reason, the research group selected urban public resourcesto explore their natural education function of city parks.

In view of Beijing, Chongqing and Lanzhou respectively located in north, southwest,and northwest area of China, belonging to monsoon climate of medium latitudes, subtropical monsoon climate and temperate continental climatewith cultures of capital city and northern gardens, near the Yangtze River in Sichuan province and Chongqing area, the Yellow River and loess plateau in northwest region, natural environments are distinct, water conservations differ profoundly[2]. As a first-tier city, a new first-tier city and a second-tier city in the west China, the appearance of city parks in Beijing, Chongqing and Lanzhou are distinctiveon conditions of local political, economic, scientific and technological environments. Therefore, based on the vision of natural education, the research group investigated the municipal level of comprehensive parks,specialized parks/historical famous parks, ecological parks and community parks in the main urban areas of Beijing, Chongqing and Lanzhou, through semi-structured interviews, participatory observation and questionnaire survey. The purpose is to promote the maximization of the natural education function of urban parks through the natural education evaluation of urban parks in the post-epidemic era, providing reference for the optimization of sustainable ecological development of urban parks with limited increment, and realizing the real integration of urban parks.

II. NATURAL EDUCATIONOFCITYPARKIS PRESENTED INTUITIVELY

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2.1 The Functional Facilities for Observing Nature

In terms of functional division, the various areas of urban parks, no matter whether they're comprehensive parks, humanistic parks or even community parks, all have natural education functions and present different characteristics. For example, in Chaoyang Park of Beijing, there are cruise ship docks, leisure resort areas, dense forests, bamboo gardens, wetland ecological areas, beach volleyball reservation areas, green activities areas and water sports areas; in Eling Park, Chongqing, there are lotus pond, flowers garden, grassland and mountain climbing area; and in Xiaoxihu Lake of Lanzhou, there are near-water leisure areas, lake sightseeing areas and shade leisure areas (seeFig 1-5).

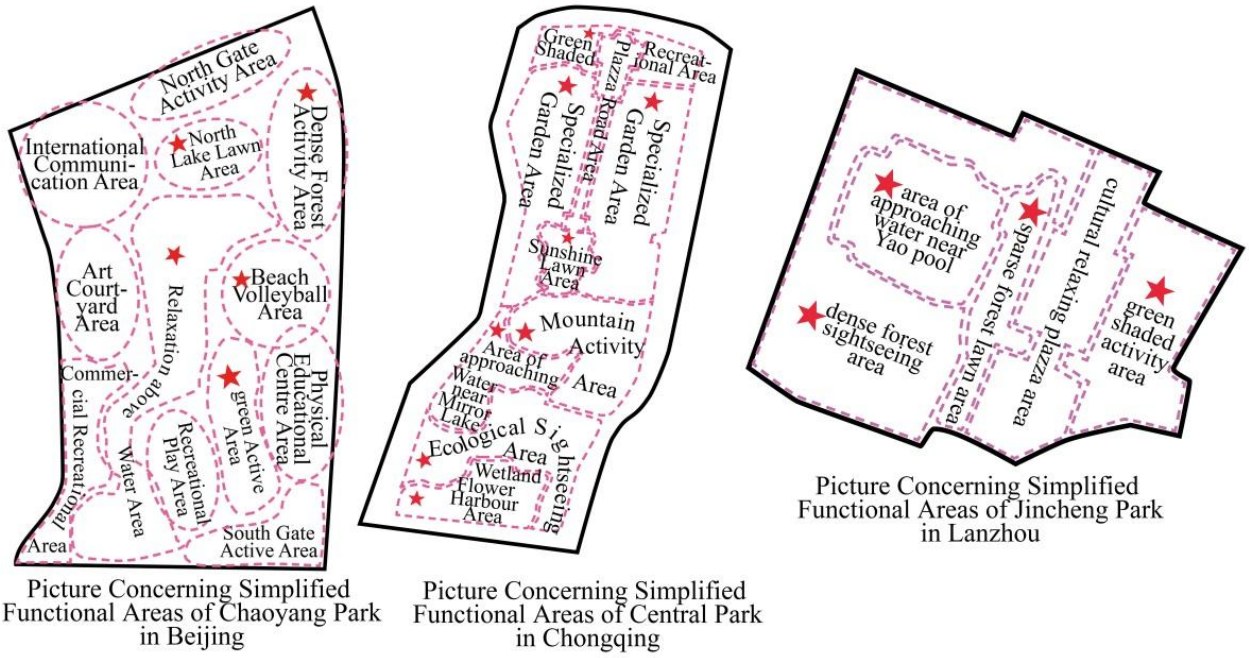

Fig1:The plan and design for natural education of municipal comprehensive parks-Chaoyang park, Chongqing Centralpark and Jincheng park

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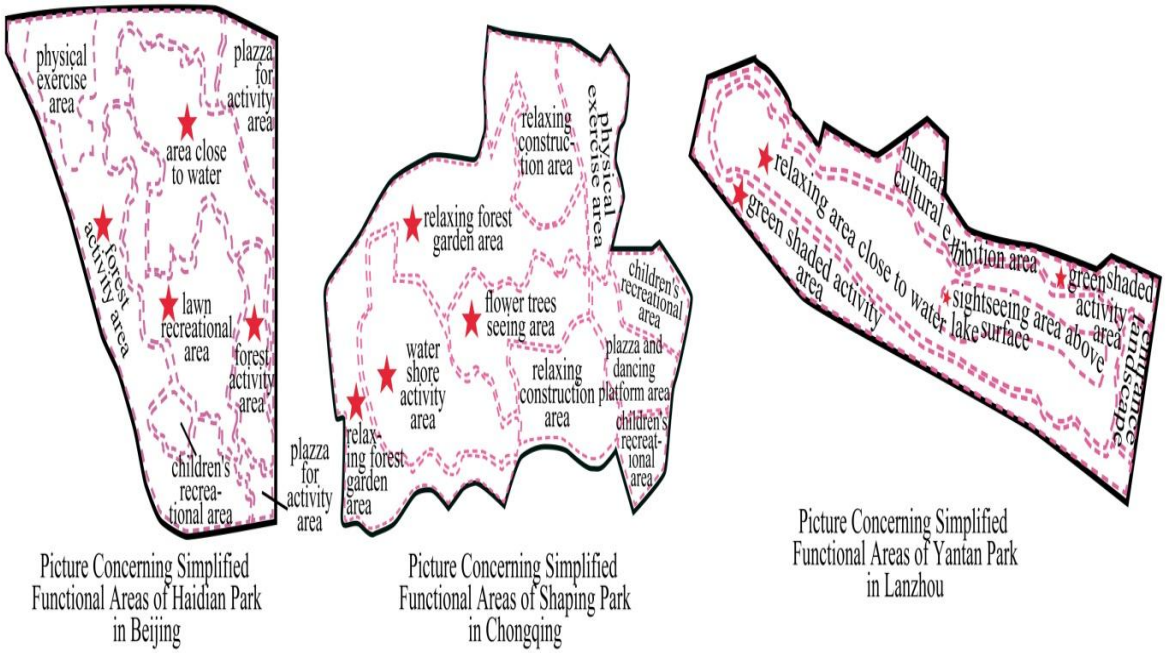

Fig2:Regional comprehensive parks-the plans and devisal areas concerning natural education of Haidian Park, Shaping Park and Yantan Park

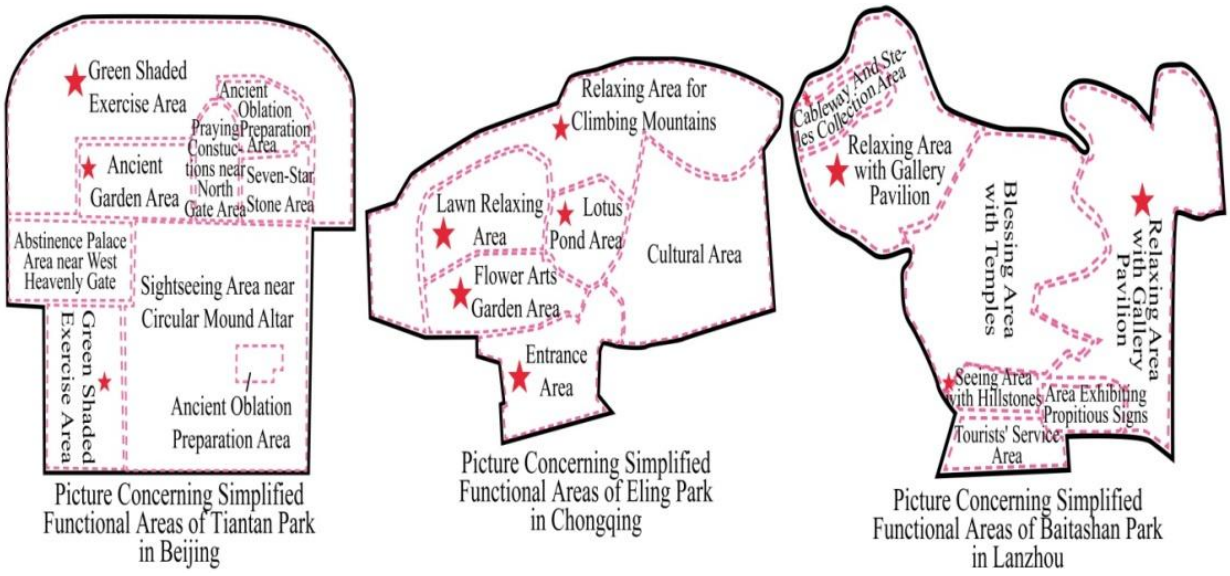

Fig3:Theme/historical gardens-the plans and devisal areas concerning natural educationof Tiantan Park, Eling Park and Baitashan Park

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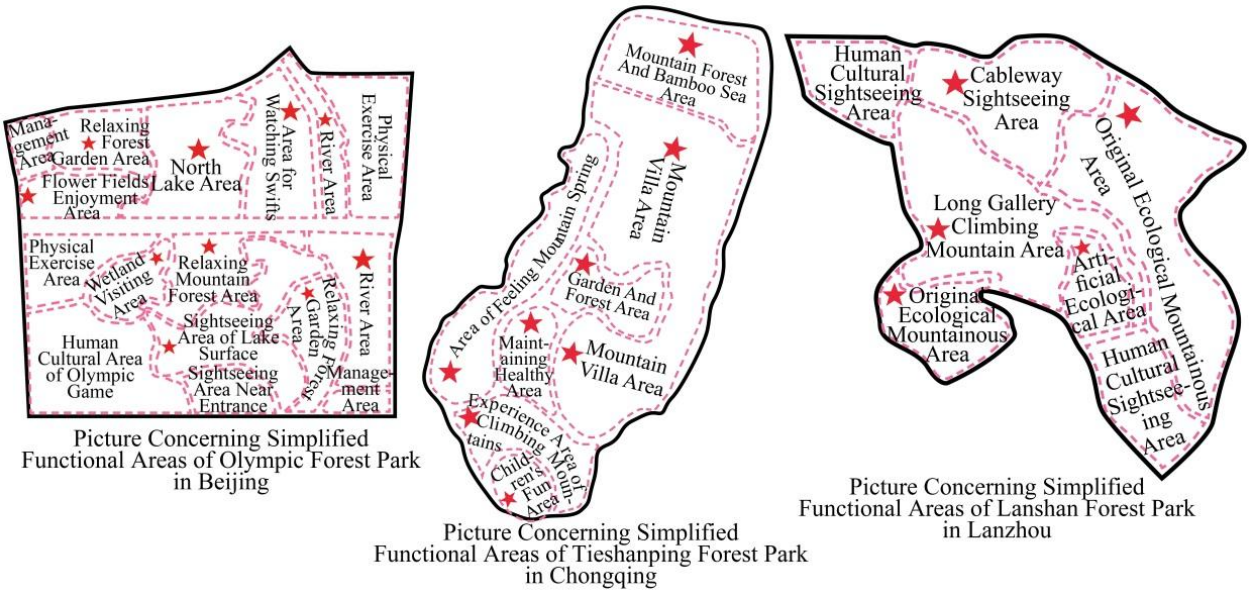

Fig4:Ecological park-the plans and devisal areas concerning natural education of Olympic Forest Park, Tieshanping Forest Park and Lanshan Forest Park

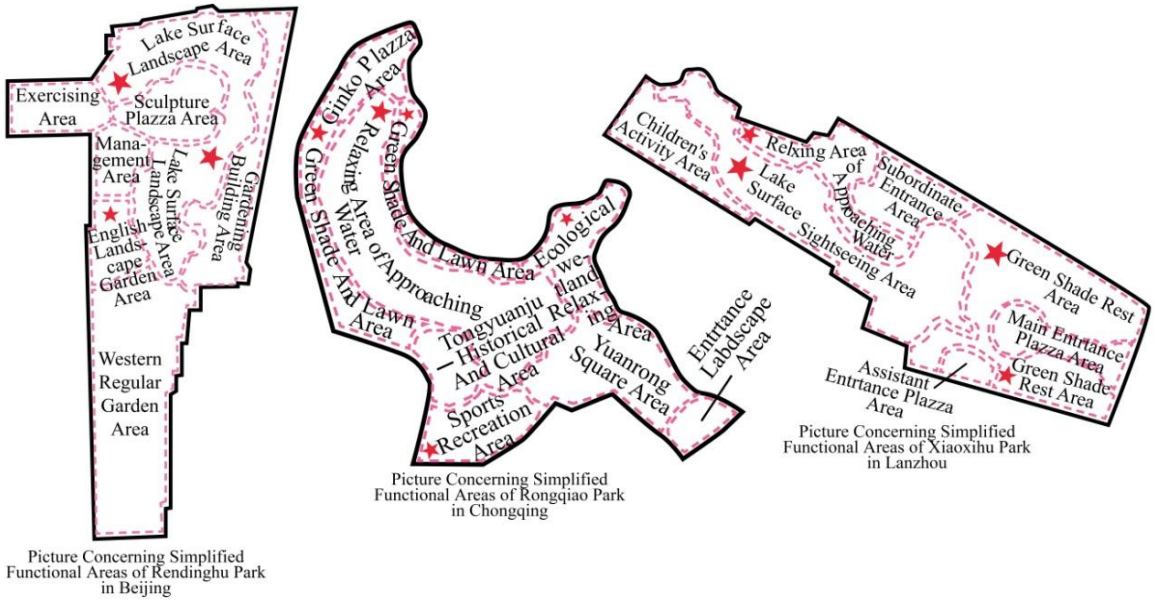

Fig 5: Community park—the plans and devisal areas concerning natural education of Rendinghu Park, Rongqiao Park and Xiaoxihu Park

(Remark: The parts marked with a ★among Fig 1-5, the simplified graphs, are areas for

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direct natural education.)

In terms of functional facilities, city parks in Beijing, Chongqing and Lanzhou all provide support for natural education through the design of "diameter, garden, display, experience, warning" and other facilities of "point-line-surface-body" and "moisten things silently". Such as the ecological covered bridge in Olympic Forest Park, the weather billboard in Chongqing Eling park, the floating island of aquatic plants in Lanzhou Rending Lake Park and Chongqing Central Park. See Fig6.

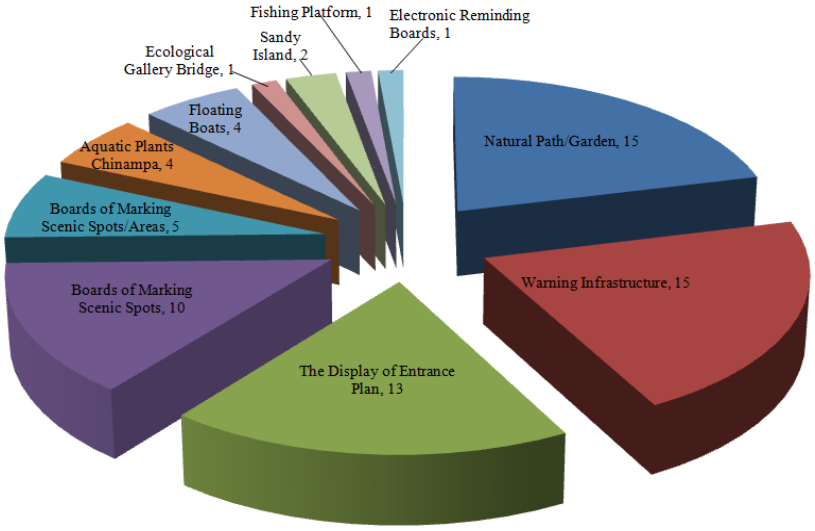

Fig6:The natural facilities of city parks

2.2 Understanding the Rich Content of Nature

When visiting various city gardens, which are the green lung for local citizens, the public are able to feel real nature, learn how to live with other creatures, and experience the harmonious co-existence between people and nature. For example, 320 species of plants with a history of more than 100 years, such as pine and cypress, and small animals, such as blue birds, oil hyacinths and squirrels, can be observed in Beijing Tiantan Park.In Xiaoxihu Park, Lanzhou, you can see the ecology of water villages in the south of the Yangtze River in the central and northern western regions reflected by the promenade garden bridge and flower bed pool. You can understand the value of integration of man and nature and biodiversity. See Fig 8They can learn about the survival skills in the wild during the picnic and camping in Beijing Olympic Forest Park. They can observe rice field birds and fish, such as Wanquan Shuyu and Guting Guanjia in Beijing Haidian Park, Chongqing's Yishan City, and Bashu Garden in Liangjiang Guancheng District of Chongqing City. They can browse the ecology of rivers and lakes in the

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south of the central and northern parts of the western regions reflected by the promenade garden bridge and flower bed pool in Lanzhou's Little West Lake Park, and see Fig7.

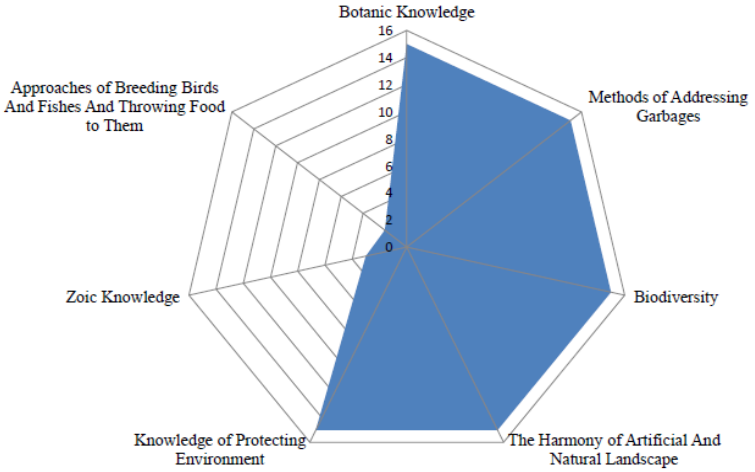

Fig7: Contents of natural education in city parks

2.3 Distinctive Forms of Feeling Nature

To live is to be educated and the environment is full of knowledge. Though there are various forms of natural education, it is mainly realized through observation, experience and exploration according to the functional partition of Beijing-Chongqing-Lanzhou city parks. Besides hiking and observing more than 200 kinds of plants, various natural experiences and explorations with special features are carried out, for example, the Rice-seedlings Transplanting Festival, the Harvesting Festival, the Bird Week, the Flower AI of Beijing Haidian Park, the Forest Competition, the Huaguo Mountain Drifting and the Ocean Roaming in Beijing Chaoyang Park, and the Sunrise and Star Observation, the City Overlooking from the highest points of Chongiqng Eling Park and Lanzhou Baitashan Park. See Fig8.

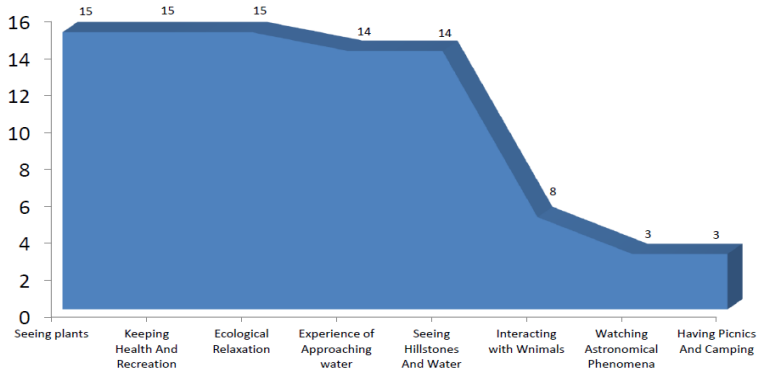

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Fig8:Natural education forms of city parks

III. EVALUATIONOFTOUSISTS' EXPERIENCEONTHE NATURALEDUCATIONFUNCTIONOFCITYPARKS-BASEDONENTROPY TOPSIS

In order to get a full understanding, the research group analyzed the tourists' experience on the natural education function of urban parks by means of entropy TOPSIS through literature review, on-the-spot investigation, questionnaire investigation, etc [3].

3.1 The Construction of Evaluation Index Regarding Natural Education of Parks Based on Entropy Weight TOPSIS

On the selection of evaluation indexes, the thesis has referred to the study of Wang Keke (2019), the tourists' experience on natural education function is mainly shown by the content, form and functional facilities [4]. Starting from this point, the research group designed a questionnaire to be distributed through the form of questionnaire stars, and 150 valid questionnaires were collected.

3.2 Evaluation Model of Natural Education of Urban Parks Based on Entropy Weight

Just as everyone has his own Hamlet, the public's impression on city parks is often subjective. For the common index weight methods, the relative comparison method, serial ratio method, entropy method, expert consultation method (Delphi method), the entropy method can calculate the weight according to the objective information of evaluation indexes provided by decision matrix, which is relatively more objective. Therefore, our research group adopted the entropy method to determine the weight, aiming at understanding the ideal solution and negative ideal solution of the natural education function experienced by the public. The steps are as follows.

Step 1: Build the original decision matrix. Now, assume there are n decision indexesfj (1≤j≤n), m feasible schemes ai (1 ≤ i ≤ m)and m schemes n indexes, xij represents the value of the j evaluation index of thei object, and then form a decision matrix:

$$X = (x_{ij}) = \begin{pmatrix} x_{11} & x_{12} & \cdots & x_{1n} \\ x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ x_{m1} & x_{m2} & \cdots & x_{mn} \end{pmatrix} \quad \text{.....(Formula 1)}$$

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Step 2: Standardization of Decision Indicators. Indicators with different dimensions should be standardized according to specific rules and converted into dimensionless indicators so as to facilitate overall comprehensive evaluation. Since the data in the questionnaire are all greater than or equal to 0, this paper adopts the linear proportional transformation method for dimensionless, which can truly reflect the relationship between the original index values.

In the decision matrix X, for the forward index fj, take: $x_j^* = \max_{1\le i\le m} x_{ij} \neq 0$ command $y_{ij} = \frac{x_{ij}}{x_j^*}$ (1⩽i⩽m). For negative index fj, take: $x_j^* = \min_{1\le i\le m} x_{ij} \neq 0$ command $Y_{ij} = \frac{x_j^*}{x_{ij}}$ (1⩽i⩽m),after transformation, a linear proportional normalized matrix is obtained: Y＝(yij)m×n：

$$Y = (y_{ij}) = \begin{pmatrix} y_{11} & y_{12} & \cdots & y_{1n} \\ y_{21} & y_{22} & \cdots & y_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ y_{m1} & y_{m2} & \cdots & y_{mn} \end{pmatrix} \text{.....(Formula 2)}$$

After variation of linear ratio 0≤yij≤1, all indexes are transformed to normal indexes, in which the superior value is 1.

Step 3: Calculate the entropy value ofjth index. Unify standardized matrix, gaining:

$P_{ij} = \frac{y_{ij}}{\sum_{i=1}^{m} y_{ij}} \begin{pmatrix} i = 1,2 \cdots m \\ j = 1,2 \cdots n \end{pmatrix}$, count the entropy value of jth index, in which k＞0,ej≥0.

$$e_j = -k\sum_{i=1}^{m} p_{ij} \ln p_{ij} \text{ (1⩽j⩽n).....(Formula 3)}$$

Step 4: Ensure coefficient of entropy weight. Calculate the difference coefficient ofjth index $g_j = 1 - e_j$ (1⩽j⩽n), the weight of jth index is:

$$w_j = \frac{g_j}{\sum_{j=1}^{n} g_j} \text{ (1⩽j⩽n).....(Formula 4)}$$

3.3 Evaluation Results Based on Entropy Weight Method jth index

By using mathematical and statistical methods, 15 city parks are given index weights from seven aspects: natural science knowledge, natural skill knowledge, recreational activity form, natural interpretation, environmental monitoring prompt, warning facilities and service supporting facilities. The evaluation index system is shown in TABLE I.

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TABLEI.Evaluation index system of natural education of parks

CRITERION LAYER	THE EVALUATION INDEX
KNOWLEDGE OF NATURAL SCIENCE	PLANT GROWTH HABIT x11, PLANT PESTS AND DISEASES x12, METHODS OF FEEDING BIRDS (FISH) x13, KNOWLEDGE OF SOIL x14, RANGE OF KNOWLEDGE x15, KNOWLEDGE OF CLIMATE x16, CLIMBING THE MOUNTAIN OF KNOWLEDGE x17, KNOWLEDGE OF FISHING x18, CAMPING KNOWLEDGE x19, SKI x110, OTHER NATURAL KNOWLEDGE x111
NATURAL SKILLS AND KNOWLEDGE	GARBAGE CLASSIFICATION x21, EARTHQUAKE RESPONSE KNOWLEDGE x22, DEBRIS FLOW PREPAREDNESS KNOWLEDGE x23, SUN PROTECTION (SAND FOG AND HAZE) KNOWLEDGE x24, KNOWLEDGE OF FIRE PREVENTION (LIGHTNING, DROWNING) x25, KNOWLEDGE OF INFLUENZA PREVENTION x26, FRAUD x27, THE ENVIRONMENTAL MONITORING x28, OTHER NATURAL DISASTER PREPAREDNESS x29
RECREATION FORMS	WALKING TOURS x31, HYDROPHILIC x32, Enjoy flower x33, VIEW SPRING (WATERFALL) x34, PLAY WITH SAND x35, ROWING x36, FLYING A KITE x37, FEED FISH (BIRDS) AND OTHER SMALL ANIMALS x38, FITNESS (DANCING) x39, MOUNTAIN CLIMBING x310, SKI x311, CAMPING PICNIC x312, OTHER x313
A NATURAL EXPLANATION	SIGN INTERPRETATION x41, PHONETIC EXPLANATION x42, VIDEO COMMENTARY x43, ARE x44
ENVIRONMENTAL MONITORING TIPS	PM MONITORING TIPS x51, NEGATIVE OXYGEN ION MEASUREMENT TIPS x52, WATER QUALITY ANALYSIS TIPS x53, SOIL QUALITY MONITORING TIPS x54, LIGHT INTENSITY DETECTION TIPS x55, NOISE MEASUREMENT PROMPT x56, FOREST COVERAGE DISPLAY x57, WILDLIFE NUMBERS SHOW x58, WIND SPEED DISPLAY x59, HUMIDITY DISPLAY x510
WARNING FACILITIES	TAKE GOOD CARE OF FLOWERS AND PLANTS DO NOT CLIMB FOLDING CLASS x61, PLEASE TREASURE THE ANCIENT AND FAMOUS TREES x62, ANIMAL PROTECTION WARNINGS x63, BAN ON FISHING

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	x64, SWIMMING IN THE RIVER IS FORBIDDEN x65, BE CAREFUL OF THE CLIFF x66, PAY ATTENTION TO THE SLIPPERY x67, BAN ON FIREWORKS x68, PROHIBIT THE PICNIC x69, A SHARP TURN x610, CIVILIZATION TRAVEL x611, PLEASE DON'T LITTER x612, THE UNOPENED AREA IS STRICTLY FORBIDDEN TO ENTER x613, FIRE CONTROL FACILITIES x614, PLEASE DO NOT ENTER THE x615, OTHER WARNING x616
SERVICE FACILITIES	REST SEAT x71, SIDEWALK RAIL x72, TOILET x73, REST PAVILION x74, RAIN SHELTER x75, THE OBSERVATION DECKx76, MINI SHOPPING x77, WATER FOUNTAIN x78, CRUISE TERMINAL x79, THE QUANTITIES x710, SMOKING POINT x711, BIN x712, WATER FOUNTAIN x713, ELIMINATE FIRE FACILITIES x714, AUTOMATIC PURCHASE POINT FOR SAFETY AND SECURITY SUPPLIES x715, SERVICE SIGNS x716, OTHER x717

By visitors' arrangement of questionnaire data regarding the contents, forms, functional installationsof natural education, all indexes are normal. Relying on $x_j^* = \max_{1\leq i\leq m} x_{ij} \neq 0$ command $y_{ij} = \frac{x_{ij}}{x_j^*}$ (1⩽i⩽m) to perform the standardization of determined indexes and next unification $P_{ij} = \frac{y_{ij}}{\sum_{i=1}^{m} y_{ij}} \begin{pmatrix} i = 1,2\cdots m \\ j = 1,2\cdots n \end{pmatrix}$, then calculate the entropy value of the jth index $e_j = -k\sum_{i=1}^{m} p_{ij} \ln p_{ij}$ (1⩽j⩽n), the differencecoefficiency of the jth index is $g_j = 1 - e_j$ (1⩽j⩽n), eventually the weight of the jth index is $w_j = \frac{g_j}{\sum_{j=1}^{n} g_j}$ (1⩽j⩽n).

After calculation, the entropy value ej, entropy weight wj and criterion layer weight of each index (see TABLEII). The entropy value ej indicates that the j index is entropy value, which represents the variation degree of the evaluated index. The greater the data variation degree, the smaller the information quantity reflected, the smaller the entropy weight gj, the smaller the entropy weight wj in the comprehensive evaluation, and the smaller the contribution of the index to the corresponding criterion layer weight.

TABLEII.Results of evaluation index regarding natural education of parks

CRITERION LAYER	THE EVALUATION INDEX	ENTROPY EJ	ENTROPY WEIGHT WJ	CRITERION LAYER

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				WEIGHT
KNOWLEDGE OF NATURAL SCIENCE	PLANT GROWTH HABIT x11	0.4719	0.0102	15.31 %
	PLANT PESTS AND DISEASES x12	0.3496	0.0126	
	METHODS OF FEEDING BIRDS (FISH) x13	0.3607	0.0124	
	KNOWLEDGE OF SOIL x14	0.3343	0.0129	
	RANGE OF KNOWLEDGE x15	0.0000	0.0193	
	KNOWLEDGE OF CLIMATE x16	0.3049	0.0134	
	CLIMBING THE MOUNTAINOF KNOWLEDGE x17	0.1735	0.0160	
	KNOWLEDGE OF FISHING x18	0.3079	0.0134	
	CAMPING KNOWLEDGE x19	0.1735	0.0160	
	SKI x110	0.1125	0.0172	
	OTHER NATURAL KNOWLEDGE x111	0.4962	0.0097	
NATURAL SKILLS AND KNOWLEDGE	GARBAGE CLASSIFICATION x21	0.5407	0.0089	10.53%
	EARTHQUAKE RESPONSE KNOWLEDGE x22	0.2079	0.0153	
	DEBRIS FLOW PREPAREDNESS	0.1386	0.0167	

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	KNOWLEDGE x23			
	SUN PROTECTION (SAND FOG AND HAZE)KNOWLEDGE x24	0.3742	0.0121	
	KNOWLEDGE OF FIRE PREVENTION (LIGHTNING, DROWNING) x25	0.3689	0.0122	
	KNOWLEDGE OF INFLUENZA PREVENTION x26	0	0	
	FRAUD x27	0.2079	0.0153	
	THE ENVIRONMENTAL MONITORING x28	0.3450	0.0127	
	OTHER NATURAL DISASTER PREPAREDNESS x29	0.3727	0.0121	
RECREATION FORMS	WALKING TOURS x31	0.5414	0.0089	16.57%
	HYDROPHILIC x32	0.5094	0.0095	
	ENJOY FLOWER x33	0.5229	0.0092	
	VIEW SPRING (WATERFALL) x34	0.2659	0.0142	
	PLAY WITH SAND x35	0.2324	0.0148	
	ROWING x36	0.2455	0.0146	
	FLYING A KITE x37	0.4115	0.0114	
	FEED FISH (BIRDS) AND OTHER SMALL ANIMALS x38	0.3525	0.0125	
	FITNESS (DANCING) x39	0.4576	0.0105	

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	MOUNTAIN CLIMBING x310	0.2643	0.0142	
	SKI x311	0.1273	0.0169	
	CAMPING PICNIC x312	0.1001	0.0174	
	OTHER x313	0.3983	0.0116	
A NATURAL EXPLANATION	SIGN INTERPRETATION x41	0.5413	0.0089	5.54 %
	PHONETIC EXPLANATION x42	0.3384	0.0128	
	VIDEO COMMENTARY x43	0.0000	0.0193	
	ARE x44	0.2554	0.0144	
ENVIRONMENTAL MONITORING TIPS	PM MONITORING TIPS x51	0.2757	0.0140	13.46 %
	NEGATIVE OXYGEN ION MEASUREMENT TIPS x52	0.3466	0.0126	
	WATER QUALITY ANALYSIS TIPS x53	0.3046	0.0134	
	SOIL QUALITY MONITORING TIPS x54	0.3669	0.0122	
	LIGHT INTENSITY DETECTION TIPS x55	0.3470	0.0126	
	NOISE MEASUREMENT PROMPT x56	0.3046	0.0134	
	FOREST COVERAGE DISPLAY x57	0.3440	0.0127	
	WILDLIFE NUMBERS SHOW x58	0.1273	0.0169	

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	WIND SPEED DISPLAY x59	0.2773	0.0140	
	HUMIDITY DISPLAY x510	0.3440	0.0127	
WARNING FACILITIES	TAKE GOOD CARE OF FLOWERS AND PLANTS DO NOT CLIMB FOLDING CLASS x61	0.5409	0.0089	18.33 %
	PLEASE TREASURE THE ANCIENT AND FAMOUS TREES x62	0.2664	0.0142	
	ANIMAL PROTECTION WARNINGS x63	0.3619	0.0123	
	BAN ON FISHING x64	0.3634	0.0123	
	SWIMMING IN THE RIVER IS FORBIDDEN x65	0.4223	0.0112	
	BE CAREFUL OF THE CLIFF x66	0.0000	0.0193	
	PAY ATTENTION TO THE SLIPPERY x67	0.4733	0.0102	
	BAN ON FIREWORKS x68	0.4562	0.0105	
	PROHIBIT THE PICNIC x69	0.3470	0.0126	
	A SHARP TURN x610	0	0	
	CIVILIZATION TRAVEL x611	0.3689	0.0122	
	PLEASE DON'T LITTER x612	0.5407	0.0089	
	THE UNOPENED AREA IS STRICTLY FORBIDDEN	0.3689	0.0122	

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	TO ENTER x613			
	FIRE CONTROL FACILITIES x614	0.5400	0.0089	
	PLEASE DO NOT ENTER THE x615	0.3336	0.0129	
	OTHER WARNING x616	0.1386	0.0167	
SERVICE FACILITIES	REST SEAT x71	0.5415	0.0089	20.26 %
	SIDEWALK RAIL x72	0.5407	0.0089	
	TOILET x73	0.5415	0.0089	
	REST PAVILION x74	0.5393	0.0089	
	RAIN SHELTER x75	0.5294	0.0091	
	THE OBSERVATION DECK x76	0.4448	0.0107	
	MINI SHOPPING x77	0.3531	0.0125	
	WATER FOUNTAIN x78	0.3495	0.0126	
	CRUISE TERMINAL x79	0.2287	0.0149	
	THE QUANTITIES x710	0.0000	0.0193	
	SMOKING POINT x711	0.3584	0.0124	
	BIN x712	0.5401	0.0089	
	WATER FOUNTAIN x713	0.3032	0.0135	
	ELIMINATE FIRE FACILITIES x714	0.5402	0.0089	
	AUTOMATIC PURCHASE POINT FOR SAFETY AND SECURITY SUPPLIES x715	0.1273	0.0169	
	SERVICE SIGNS x716	0.3773	0.0120	

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	OTHER x717	0.2079	0.0153	

Source: entropy weight method model solution, data collation.

As can be seen from the above table, in terms of natural education content, x15 > x110 > x17 > x19 > x16 > x18 > x14 > x12 > x13 > x11> x111, the top four mountain range knowledge, ski knowledge, mountain climbing knowledge and camping knowledge are the key factors influencing the popularization of natural education knowledge of parks, accounting for 1.93%, 1.72%, 1.60% and 1.60% respectively. X23 > x22 > x27 > x28 > x25 > x24 > x29 > x21 > x26. Debris flow prevention skills, earthquake response skills and fraud prevention skills are urgently needed in the popularization of park natural education skills. As for the form of natural education, x312 > x311 > x35 > x36 > x34 > x310 > x38 > x313 > x37 > x39 > x32 > x33 > x31. Affected by the environment of city parks, tourists have a greater demand for camping picnics in recreational activities, accounting for 1.74%. In terms of natural education facilities, x43> x44> x42> x41, video commentary plays an important role in the form of natural commentary, accounting for 1.93%; X58 > x51 > x59 > x53 > x56 > x57 > x510 > x52 > x54. The environmental detection tips tourists most want to see are wildlife quantity, PM monitoring tips and wind speed display. X66 > x616 > x62 > x615 > x69 > x63 > x64 > x611 > x613 > x65 > x68 > x67 > x61 > x612 > x614 > x610. Caution cliff has the greatest entropy in warning facilities. On the index of service facilities, the entropy weight of rest seats x71, sidewalk guardrails x72, toilets x73, rest kiosks x74, garbage bins x712 and fire suppression facilities x714 in most parks are 0.89%, which is relatively perfect. However, the entropy weight of medical point x710 and automatic purchase point x715 for safety protection materials are relatively large, which are 1.93% and 1.69%, respectively, indicating that there are still obvious deficiencies in the settings of medical point and automatic purchase point for safety protection materials in parks.

IV. OPTIMIZATIONANDIMPROVEMENT PATHESOF NATURAL EDUCATIONFUNCTIONOFCITYPARKSIN POST-EPIDEMIC ERA

According to the survey, tourists' best evaluation concentrates on the ecological environment function, the ornamental function, leisure, entertainment and fitness function while the worst is often connected with the science popularization education, disaster prevention and avoidance, and consumption. The average matrix t value is -0.59, -0.52, -0.67 respectively, as shown in fig9. Therefore, the prevention functionin the post-epidemic era need more attention and should be optimized to fulfill the social responsibility of natural education and give full play to the best classroom for natural education of city parks.

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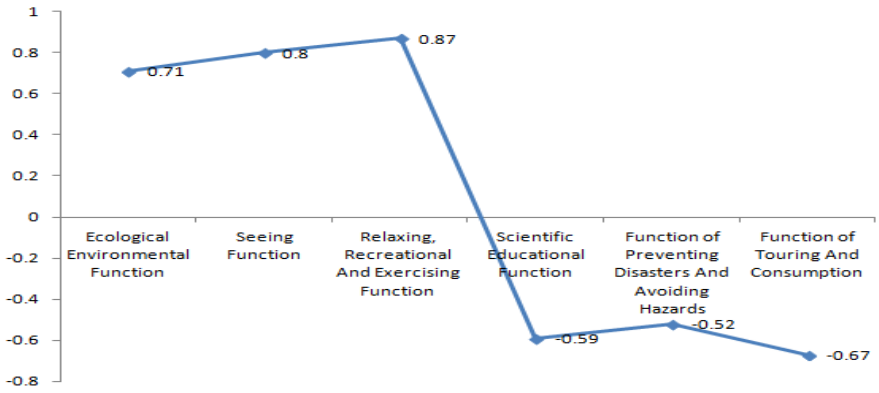

Fig9:Average matrix scores concerning functions and effects of natural education in parks

4.1 Focus on Optimizing Facilities and Perfect the Functions of Point, Line, Surface and Body

Making visible and invisible is a great advantage of natural education in urban parks [5]. After the epidemic, safety, intelligence and warning have become the first choice for the public (tourists) to use public facilities. According to the survey, the public (tourists) pay more attention to the safety of public facilities, hoping that the optimized and perfect facilities will include intelligent fitness, intelligent instruction and explanation, healthy relationship between people and animals and plants, normalization of popular science knowledge, etc. Fig 10. Therefore, it is necessary to focus on optimizing the function of natural education facilities to enhance their guidance and interest. One is to do a better job of refinement. It is necessary to grasp the key points of the park, such as theme points, signage points and festival celebration points, to optimize and perfect them. The theme gardens such as Guangxi Garden and Orange Garden need to refine the knowledge of popular science on plants and integrate relevant small-scale popular science experiences into them. Widely use holidays, especially the Spring Festival, National Day and other large festivals to upgrade popular science facilities. Display basic defense facilities such as earthquakes, floods, mudslides, plague, SARS, H7N9, and Cornovirus-2019 pneumonia, and let the public have natural experiences through intelligent interpretation. To do fine signs, the implementation of plants, scenic spots full coverage of signs, moderate integration of all kinds of flowers and trees habits, rarity, plant diseases and insect pests, ecological contribution, etc. Gradually integrate park environmental quality display and artificial intelligence into experience node facilities. The second is to expand online and offline. According to seasonal changes and park theme activities, micro-video displays such as online "cloud park", "cloud science popularization" and "cloud epidemic prevention" will be well displayed, which will be combined with offline robot epidemic prevention safety and health popular science explanation. For example, in spring flower show, pollen allergy and

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influenza simulation demonstration will be conducted, so that vulnerable groups such as the elderly and children can enhance their knowledge of pollen allergy and influenza epidemic prevention through online and offline. The third is to do a good job in the docking of rock water interpretation and warning detection facilities with tourist entities. According to the actual situation of the park, all kinds of warning facilities and environmental detection tips will be gradually completed, and the facilities will be beautified and designed so that serious warning and detection boards will become warm and amiable safety and health guards. For example, climbing mountains includes a series of warm techniques such as anti-fall, anti-skid, lightning protection, anti-debris flow and so on. At the entrance of each functional space, there are landscape walls or standing stones showing the names of scenic spots. The shapes have their own styles. The stone body and water body characteristics are expressed in playful and friendly cartoon language and profound ancient poetry words, which can enhance the attraction. To strengthen the upgrading and optimization of park safety facilities, small shopping points and automatic purchase points for safety materials should be set up in scenic spots, basic disaster prevention facilities should be equipped and corresponding explanation and guidance should be given. See Fig 11.

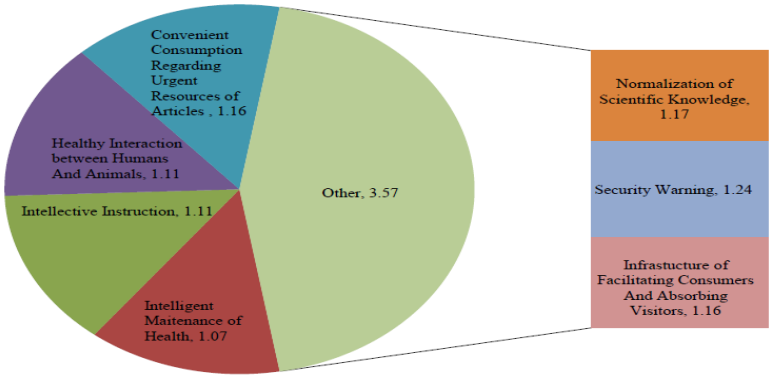

Fig10:Average scores of matrix where parks in cities need prioritizing and improving

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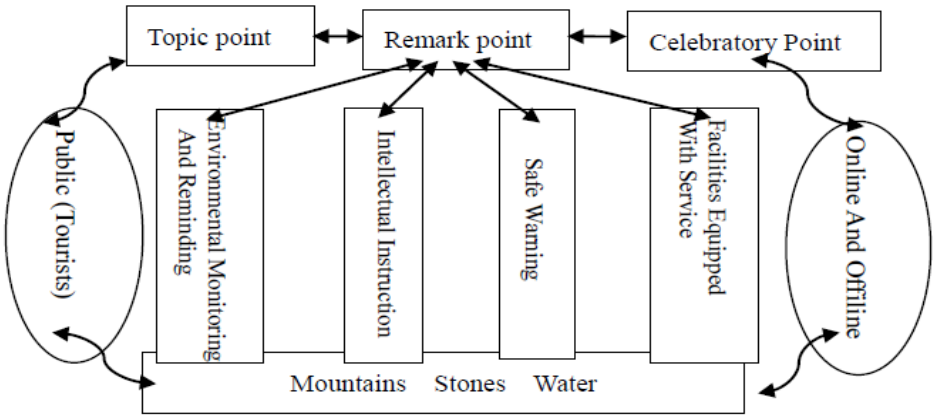

Fig 11:Picture of crucial optimized facilities in city parks

4.2 To Optimize to Expand the Form as the Starting Point, to do a Good Job in the Content Optimization of the Park

Melting intangible into tangible is another advantage of natural education in city parks. The memory of the epidemic can accompany one's whole life, and the flexible habitat of tourism, teaching and music is fascinating. After the epidemic, it is necessary to fully explore the experience and characteristics of natural education in urban parks, so that the public (tourists) who enter city parks can enrich their knowledge, purify their thoughts, and truly feel the soul of the connection between human beings and natural ecology. One is to strengthen the design of park activities. According to research, the top three activities that the public (tourists) or their families (children) most want to carry out when visiting the park are leisure, science and health, as shown in Fig 12. The Temple of Heaven Park in Beijing holds hundreds of popular science activities for plants, birds and insects every year, attracting thousands of residents. Beijing Haidian Park's Farming Festival and Harvest Festival have become routine and characteristic activities for local residents. Therefore, it is necessary to strengthen the investigation of residents around the park, highlight various kinds of activities according to needs, and promote the skills of harmonious coexistence between human beings and animals and plants through a series of bird watching activities, food throwing activities, fixed-point observation activities of certain plants, and follow-up activities of plant doctors, so as to make the activities in the entrance image display area, folk culture popular science area, landscape wetland natural landscape area, agricultural creative area, children's happy living area, ecological commercial street area, landscape art area, and rest and recuperation area interesting, deep in theme, and suitable for movement. The second is to optimize the form of education in Jingyuan. Enrich the educational nature of popular science education paths, tree study gardens and other garden paths in the beautification of garden paths through orderly guidance. Do a good job in the

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investigation of insects, birds, wetlands, rare and precious species, geology and climate in the park, have a popular science education form, integrate science, creativity, art and management intention, and design and integrate the history of various parks, geological soil and climate characteristics, plant habits and growth protection precautions, ecological environment, etc. in a popular way. Third, timely repair is required to promote the integration of green vein, cultural context, human contacts and scientific vein. Through sponge city and rainwater garden, the tracking cycle of garbage classification and water quality purification will be demonstrated to enhance environmental awareness. Negative oxygen ion measuring instruments, water quality analyzers and noise monitors will be gradually introduced into ecological parks and comprehensive parks to show negative oxygen ion real-time monitoring, water quality analysis and noise level, so that the public can experience simple water quality purification principles and noise knowledge, and enhance the public's (tourists') perception of natural environment value. While satisfy that self-produced original ecological cultivation mode through organic farms and public vegetable garden, the simulation demonstration of preventing various natural disasters will be carried out in a planned way to the public, especially family, so that the public can feel various biological crises and natural resources, improve the public's disaster preparedness and protection ability and the natural ethics awareness of respecting nature, fearing nature and protecting nature [6]. In particular, it is necessary to strengthen the publicity of endangered animals and plants through the warning signs with rich sounds and feelings, to infiltrate into the recreation and leisure of the park imperceptibly and in an easy-to-understand form, so as to enhance the public's correct view of nature and health preservation.

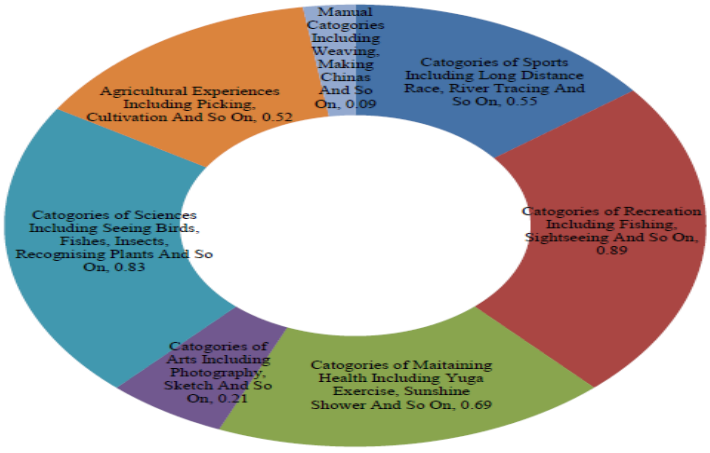

Fig12:Averagescores of activity matrix public (tourists) or family members (children) expect most

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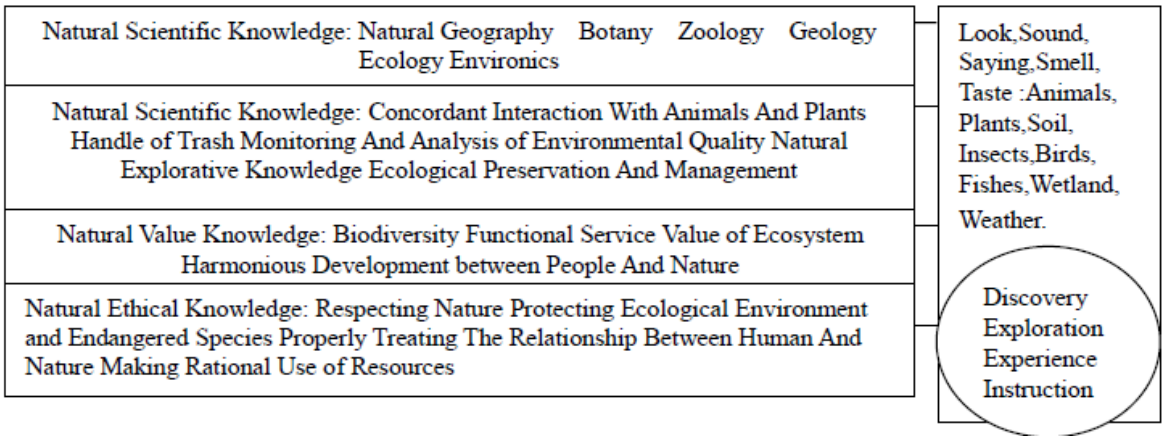

Fig 13: Expanding and optimizing the content of natural education

4.3 To Promote the Optimization of the System While Focusing on the Home, Park and School

Turning fragments into eternity is the charm of natural education in city parks. With the upgrading reflection on public health, natural ecology and other issues during the epidemic period, the islanding of urban parks and fragmentation of natural education after the epidemic will be optimized with the promotion of modern urban governance. Firstly, the formulation and publicity of natural education policies will be strengthened. Popular science experts will carry out surveys on natural education of school and city parks to ascertain focuses of different layers. Then natural education of urban public resources will be integrated into various upcoming "14th Five-Year Plan" plans with reference to the principles, standards, norms and detailed rules of the wildlife protection law and the future climate and ecological development of the world.

Secondly, the teaching materials, environment, contents and facilities will be incorporated into the government's public defense system. The natural resources of city parks should be adopted to improve the park signs, the popular science display, the disaster prevention and safety, andthe barrier-free design. Besides, the intelligent vending machine should incorporate basic preventives such as band-aids, masks, gloves, beverages, snacks, etc.

Thirdly,strengthen the links among parks, schools and families [7]. For the group of students and the elderly, it is necessary to upgrade the docking of students majoring in landscape architecture and environmental protection in universities with these groups' fixed points (parks), fixed times (after school), fixed themes (specimen making, plant cognition, insect observation, etc.). Through the interactive volunteer explanation activities between landscape architecture students and various groups in universities, not only can various public

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strengthen their awareness of the natural environment, but also can improve the utilization rate of urban parks. All kinds of parent-child theme activities for children's families in urban parks and fitness and health promotion theme popular science activities for retired elderly people in urban parks can make some single "landscape-making" urban parks that blindly follow western lawns and become "ecological islands" move forward [8], improve their accessibility and participation, and enhance their natural situation experience. Through this, the quality of ecological viewing, leisure and entertainment, popular science education, disaster prevention and avoidance of urban parks can be comprehensively improved, and the integration of urban parks can be truly realized,displaying natural ecological education skills with schemes to the public, especially families.

V. CONCLUSION

In short, during the period when epidemic broke out, the contactless delivery of intelligent robots and the quarantine supervision and publicity by UAV have become popular choice. As normal prevention of epidemic integrated with work, study and life, the sustainable application of information and intelligence in the public domain will attract the public attention, which requires intelligent scientific technology to update and optimize parks on the base of the researches and estimates regarding the flow and variety of disasters, in order to promote the upgrade of natural education [9].

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