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Visitor Knowledge Consumption Behavior Pattern Classification-Based Museum Exhibition Design Studies

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Abstract: How to draw social public to go to museums to view various exhibitions to achieve the education function of museums in the urban public cultural service system? Combining with consumers' learning behavior theory, this paper classifies the knowledge consumption behavior mechanism of visitors' exhibition access, and then reaches the exhibition patterns and the solutions of visitors' consumption experiential scenario design via onsite visitor interviews and statistical analysis on the date acquired from questionnaire surveys, to make it possible for smooth joining and matching between exhibition modes and the visitors' behaviors to accept new knowledge so as to improve the quality to experience the city life in economy era.
Key words: Behavior pattern; Knowledge acquisition; Visitor classification

1. INTRODUCTION

The growing interests in cultural phenomenon in intelligentsia as well as the urban residents' requirements on knowledge consumption and updating in terms of experience and participation represented by tourism, make museum turn into one of the most promising cultural institutions in current society. In addition to inheriting and recording cities' histories and cultures and embedding in cities' contextual texture, museums in modern society can as well enrich the cultural life of city residents, create unique city resident cultures, and develop unique city tourism resources, from which to establish city brand (WANG, 2010).

Museum theorist Stephen Nashville compares the recent museum development process as the change of "From focusing on things to serving people": previous museums focused on colleting and protecting cultural relics; yet currently museums focus on offering public education service instead. From original institution to mainly focus on collection internally, museums have increasingly grown into the institutions to externally provide society and visitors with services. From the very beginning, the museums' evident education role was very important, and it is vitally important for museum missions in the 21st century to understand the core status of education. Bruce Altshuler stresses that there are two aspects in museums'

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education level: artwork exhibition patterns and the activities to explain the artworks to visitors inside museums.

China currently has over 2400 museums of various types, among which there are 1722 cultural relic system museums, and the number of other types of museums including personal and industrial ones has reached over 600. And total museum collections have reached 20 million, among which cultural relic system museum collections nationwide have reached more than 13 million. There are 700 museums in China achieve complete free of admission charge. There are nearly 10,000 display exhibitions annually; yet there are only 180 million visitors, in another word, there is just one person out of eight visits museum once a year (WEN, 2008).

How to draw social public to go to museums to visit various shows in order to achieve the due significance of museums as the essential part of urban public cultural service system as well as promote the public cultural service requirements they carry to generate the sound interaction of individuality and as well diversity between the museum exhibitions, the knowledge disseminators, the visitors, the educatees, and then mutually complement, too? Combining with learning behavior theory, this paper tries to apply clustering analysis statistical method to investigate the learning behavior mechanism in city residents' knowledge consumption process, and how to pertinently design exhibition modes and consumption experiential scenarios to archive the smooth matching and docking between visitors' new knowledge acceptance and the exhibition modes.

2. THE THEORETICAL HYPOTHESIS ON THE CLASSIFICATION OF VISITORS′ KNOWLEDGE CONSUMPTION BEHAVIORS

Exhibition pattern in museums is rather unitary and can not attract every single visitor; it is therefore fairly important to study the processes to accept new knowledge and acquire new experience for various types of visitors. What if consumers are able to interpret the information and knowledge integrated into the collections they are face and acquire corresponding subjective effectiveness experience $U(K_0 \cdot K_1)$ and knowledge increment $\triangle K$, depends on their knowledge reserve K_0 or the assistance of external aiding system K_1.

Based on the museum teaching mode (HEIN, 1998) proposed by George E. Hein and the extended discussion (CHEN,2003) by Chen Weiping, it can discover that there are two opposite views in every dimension if the discussions are conducted in two dimensions of epistemology and theories of learning. This paper selects a more general learning mechanism for visitors to acquire new knowledge as the classification standard to distinguish visitor types. Further, it can design exhibition modes more suitable for visitors' needs based on visitor classification study to perform exhibition collection coding to let museums' social education function be fully achieved.

The first distinction is in epistemological dimension, and there are two extremes are "Knowledge is priori objective" and "Knowledge is subjective experience" respectively. The second distinction is in theoretical dimension, and there are two extremes are "Learners build up knowledge" and "Knowledge incremental learning" (BAN, 2001) respectively. Therefore, in terms of two dimensions (or vector), it can distinguish four types of learners' learning mechanisms with different combinations that are explained as follows (showed in Figure 1).

Epistemology\ Theory of knowledge	Knowledge is priori objective	Knowledge is subjective experience
Learners build up knowledge	Ⅰ – Discovery learning	Ⅱ – Traditional learning mode
Knowledge incremental learning	Ⅲ–Behaviorism learning mode	Ⅳ–Knowledge-making learning mode

Figure 1: The Distinction of Visitors' Knowledge Acquisition Behaviors

(1) Discovery learning: Learners need to personally experience, observe, and practice, instead of being content to be taught; and Knowledge disseminators need to help learners with better participations. The discovering mode focuses on learners themselves and is the proactive learning mode with hands-on practice, concentrated learning performance, and sound awareness.

(2) Traditional learning mode: Based on full teaching-content mastery and their logical structure, disseminators pass the knowledge to learners via the logical order that is easier to understand for learners.

(3) Behaviorism learning mode: Knowledge does not independently exist beyond learners, and is acquired by learners through gradually accumulated experience; and this is the method to learn through direct experience.

(4) Knowledge-making learning mode: Either knowledge itself or the mode to acquire knowledge is associated with learners' subjective psychology. The process for learners to build up knowledge is not simply adding new materials on previous base; it rather restructures and creates while interacting with objective world, obtains knowledge, and develops learning ability as well.

The "Knowledge-making" in museums' education spread is the interactive result between visitors and their material and cultural environment: visitors constantly absorb information from surrounding material or cultural world with their senses, and organize and screen them accordingly so as to build up their own knowledge and cognitive system.

3. EMPIRICAL STUDIES

3.1 Data sources

Based on above theoretical hypothesis, this paper designs the questionnaire for sampling survey to acquire empirical data to conduct empirical tests. And the exhibitions selected for the questionnaire primarily include following three: "Beihong's Word Tour – The Special Exhibition of Xu Beihong's Original Artwork in Shandong"[3]; "The Fifth Shandong International Art Expo"[4]; and "Chinese Wash Painting Focus"[5].

In survey, we took individual and undifferentiated random sampling method on visitors, and the survey mainly focused on visitors' basic data and post-visit feelings. We stressed the principle of voluntary participation while sending out the sheets to insure every single interviewee to individually respond his/her true feelings, among which there were 100 visitors randomly invited to answer the questionnaire sheets and 50 valid questionnaire sheets were collected in the sampling of "Beihong's Word Tour – The Special Exhibition of Xu Beihong's Original Artwork in Shandong"; 100 questionnaire sheets were sent out and 91

[3] Hosted by Shandong Provincial Party Committee Propaganda Department, Cultural Department of Shandong Province, and Literary Federation of Shandong Province; undertaken by Artist Association of Shandong Province, Xu Beihong Memorial, Shandong Shengshi Artwork Investment Consultation Center, and Qilu Evening News. The exhibition was held in Shandong Museum from May 2 to 18, 2008, and there were nearly 60 Mr. Xu Beihong's classic original traditional Chinese paintings, canvas, watercolor paintings, and gouaches exhibited, drawing nearly 100,000 visitors.

[4] Hosted by Literature and Art World Federation of Shandong Province, Broadcasting and Television Bureau of Shandong Province, Shandong TV Station, and Artist Association of Shandong Province; and undertaken by Shandong TV Painting and Calligraphy Institute, The Fifth Shandong International Art Expo was held from September 21 to 26, 2008 in Shandong Shungeng International Conference and Exhibition Center. There were over 300 institutions of painting academies, galleries, auction companies, and artwork companies as well as more than 2,000 people including nationwide prestigious painters attended the exhibition; there were more than 6,000 pieces of traditional Chinese paintings, canvas, watercolor paintings, gouaches, woodblock prints, handicrafts, and adornment artworks exhibited, drawing more than 300,000 visitors.

[5] Hosted by Cultural Department of Shandong Province and Cultural Department of Heilongjiang Province, and undertaken by Artist Association of Shandong Province and Harbin Normal University, "Chinese Wash Painting Focus" – two-place art exchange exhibition was held from September 28 to October 4, 2008 in Shandong Gallery. There were more than 200 fine artworks from 30 painters in two provinces showed in the exhibition, drawing near 10,000 visitors.

valid questionnaire sheets were collected in the sampling of "The Fifth Shandong International Art Expo"; and 50 questionnaire sheets were sent out and 24 valid questionnaire sheets were collected in the sampling of "Chinese Wash Painting Focus"; the rate of total questionnaire sheet collection was 66%.

3.2 The clustering analysis on the survey data

We selected clustering analytical method to conduct distinguished sturdy. The fundamental idea of this method is to define distance among samples to represent the similarity among different samples by putting the target data into a smaller number of relatively homologous groups or "clusters". And it classifies samples one by one based on the size of their similarity, and clusters with close relationships will be gathered into a smaller clustering unit and then it expends gatherings gradually; similar samples with distant relationships will be gathered into a bigger clustering unit and all samples have been gathered to form a pedigree chart representing affinity-disaffinity relationships. Particularly, we selected quick clustering method that is also called dynamic clustering method. It first roughly clusters samples based on actual issue significance and then revises according to certain principle until the clustering is relatively rational. The number of clusters remains the same in the clustering process, or the number of initial clusters.

First, we select initial variables to conduct clustering analysis.

Based on associated literature experience and theatrical hypothesis proposed by this paper, we selected exhibition-visiting experience (question item x19), related reading (question item x20), professional background (question item x21), personal participation and experience (question item x30), experience accumulation (question item x31), exhibition layout logicality (question item x32), and psychological subjective feeling (question item x33) as clustering analytical variables. The clustering analysis was then conducted based on the variables selected, and the samples were clustered into four types of learning mechanisms generalized by this paper. The Tables 1-4 show analytical results.

Table 1: The Center of Gravity for Groups after 4-Class Clustering

	Cluster			
	1	2	3	4
x19	3.81	4.34	3.40	3.70
x20	4.33	4.42	2.91	3.61
x21	3.62	4.58	3.83	3.21
x30	2.71	4.59	3.13	4.39
x31	3.52	4.50	3.62	3.58
x32	4.10	4.42	3.36	3.27
x33	4.00	4.47	3.45	3.42

Table 2: The Variance Analysis of 4-Class Clustering

	Cluster		Error			
	Mean Square	df	Mean Square	df	F	Sig.
x19	8.537	3	0.596	161	14.323	0.000
x20	22.910	3	0.446	161	51.362	0.000
x21	15.378	3	0.526	161	29.225	0.000
x30	32.137	3	0.278	161	115.401	0.000
x31	10.996	3	0.586	161	18.753	0.000
x32	14.799	3	0.514	161	28.770	0.000
x33	12.674	3	0.519	161	24.403	0.000

Table 3: The Sample Number of Each Group of 4-Class Clustering

Cluster	1	21.000
	2	64.000
	3	47.000
	4	33.000
Valid		165.000
Missing		0.000

Based on clustering result we classified 165 visitors into four categories. And it can be found that there are 21, 64, 47, and 33 sample numbers for category one, two, three, and four respectively. And according to the theoretical analysis hypothesis proposed by this paper, variables selected, and their given values, the 165 visitors can be summarized as, discovery learning visitors, traditional mode learning visitors, behaviorism mode visitors, and constructivism mode learning visitors respectively.

Table 4: The Interviewee Distinction Corresponding Four Class Learning Mechanisms

Category	Main Characteristics	Sample Numbers
Discovery learning	Personally experience, observe, and practice in learning process	18,23,26,33,43,48,56,65,78,79,86,93,94,95,101,104,116,126,128,134,136,142,152,160
Traditional learning	Learners accept and acquire knowledge in logical orders that they can easily understand	9,11,14,15,16,17,22,28,30,31,42,44,46,47,51,52,53,54,55,56,59,60,61,62,63,70,72,73,75,84,88,89,90,92,96,99,100,103,107,108,109,111,112,113,114,121,123,124,125,129,130,131,133,139,140,141,145,146,147,148,149,156,158,164
Behaviorism learning	Learners learn by their direct experiences and they gradually accumulate experience and acquire knowledge	1,3,4,12,19,20,27,29,34,37,38,39,40,41,49,50,58,64,66,69,76,79,80,82,83,91,97,102,110,117,118,119,120,122,127,135,137,138,143,144,150,152,153,154,155,159,161,163
Knowledge making learning	The process for learners to build up knowledge is to restructure and create while interacting with objective world, obtain knowledge, and develop learning ability as well.	2,5,6,7,8,10,13,21,24,25,32,35,36,45,57,67,68,71,74,77,80,81,85,87,98,105,106,115,132,134,151,157,162,165

4. THE EXHIBITION DESIGN SUGGESTION BASED ON EMPIRICAL ANALYSIS

We have distinguished four categories of learners' learning mechanisms in two dimensions of epistemology and learning theory. Based on the clustering analysis on the variables selected, this study classifies the visitors of three exhibitions into four categories, and these categories of visitors have their own unique visiting experience behavioral characteristics and the learning mechanisms to acquire new knowledge respectively. Accordingly, we can as well develop pertinent exhibition design plans countering to different knowledge acquiring behaviors from different visitors.

4.1 The exhibition design solutions pertinent to the discovery learning mode

Discovering learners need to personally experience, observe, and practice in exhibition-visiting learning process, instead of just being content with spoon-feeding learning pattern in classrooms. The key of this

mode is learners themselves and this is the proactive learning mode with hands-on practice, concentrated learning performance, and sound awareness. Knowledge disseminators need to help learners with better participations in order to obtain better learning results.

Countering to the visitors with such learning behavior characteristics, exhibition planning party in museum exhibitions, under the assistance from aid workers, can let visitors classify, explain, experience, and self-discover and examine what have learned from exhibition with their own sensory records of listening and touching, which is completely different from immediately informing learners the answer keys and conclusions of associated issues. It rather focuses on the discovering teaching theories such as "Learn by doing" and "Self-discovery", etc. What museums can think about is to arrange most learner-oriented learning activities and situations and allow back and forth explorations in exhibitions. For example, exhibition labels and illustration tugs can be presented in questioning approach and therefore visitors need to find out answers themselves, visitors conduct assessment on their own, and there is no unique answer and the answer is rather divergent. It also can arrange experts to teach exhibition-visiting experiences and methods to enlarge visitors' imaginary space and improve their appreciation abilities.

4.2 The exhibition design solutions pertinent to the traditional learning mode

The characteristics of traditional learners are: as the knowledge disseminators, teachers need to pass the knowledge to learners via the logical order that is easier to understand for learners based on full teaching-content mastery and their logical structure. Based on this point, learners just follow the logic structure of the knowledge to learn and learn new knowledge according to the learning clues sorted by the knowledge disseminators.

The measures can be taken by museum exhibition design parties are: show composition factors such as various volume labels, tables, and explanation cards, rank them neatly in a simple-to-complicate order with clear beginnings and endings, and classify, record, keep, and exhibit collections by their species attributes; history museums present relics based on chronology; and art museums exhibit collections by artistic style or country, etc.

4.3 The exhibition design solutions pertinent to the behaviorism learning mode

The beliefs of behaviorism mode learners are: knowledge does not independently exist beyond learners, and is acquired by learners through gradually accumulated experience; and this is the method to learn through direct experience. Since stressing learning is the jointing of stimulus and response, this mode advocates to form and change behaviors, environments, and conditions via intensifications and simulations. For instance, stimulus and behavior-affecting intensification are two important factors of learning, and learning is equivalent to the result of behaviors. To acquire effective learning effects, learners need to be "intensified" timely, and the best way to achieve this kind of intensification is to let learners know their own learning effects in a timely fashion to recognize correct learning behaviors and correct incorrect learning behaviors.

In museum exhibitions, visitors can be allowed to conduct hands-on activities in visiting process and certain rewards (material or spiritual) can be offered as the sidekick, to constantly intensify their learning effects. Since there is an immediately effective rewarding and punishing mechanism, visitors' responses when running into problems in new knowledge learning process can be timely intensified or restrained.

4.4 The exhibition design solutions pertinent to the knowledge-making learning mode

As a type of learning mode of cognitive learning theory, knowledge-making learning mode believes that either knowledge itself or the mode to acquire knowledge is associated with learners' subjective psychology. The process for learners to build up knowledge is not simply adding new materials on previous base; it rather restructures and creates while interacting with objective world, obtains knowledge, and develops learning ability as well. They highlight the cognitive main body function of learners while

knowledge disseminators are rather the assistants and promoters of sense-making. Learners are the main body of information process as well as the proactive makers of sense. It needs to let learners fully play their initiatives and give them various opportunities to apply what they have learned in different situations, and let learners establish their own understandings on objective things as well as create the solutions for resolving actual problems based on the feedbacks from their own behaviors.

The key for knowledge-making learners to acquire new knowledge and knowledge-acquiring rate is how to arrange learning environments as well as check if every single visitor can proactively learn from knowledge, environment, and society as so to build up new knowledge. George E. Hein believes that every single museum has its own opportunities and features it needs to think about following issues in view of how to design exhibition countering to this part of visitors: Every single person has generated plenty of various knowledge and experience via both heredity and environment-interaction, museums are supposed to pay attention to connecting visitors' existing knowledge and experience to make them generate new knowledge and experience. As well museums can use side tools such as visiting guides and symbols, maps, and charts, etc to let visitors know related issues such as where they are and visiting notices. In addition to using the rules of familiarity, comfort, and already-known, etc to draw visitors, museums can also design appropriate small events to guide visitors to accept new knowledge and conduct in-depth learning.

Museum exhibition planning parties can design different exhibition modes and promotion strategies pertinent to the experience behavioral characteristics and learning mechanisms: launch more visitor surveys and studies and special visitor groups' visiting behavior study can not be ignored, understand visitors' learning modes and pay particular attention on reading visions and sensory learning such as hearing, smell, and touch, and use various reference books, computers, demonstration commentaries, and onsite exhibition guidance, etc as visitors' exhibition-visiting aiding tools; fully exert visitors' imagination via paintings, 3D models, music composition, and simulations; and flexibly use modern technologies such as computer to increase visitors' perceptions and visiting joys. Different ages have different development requirements and interests; it therefore can design different exhibitions for different visitor groups upon their own needs.

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