The Online Guidance System of Learning Style and Learning Strategies for Chinese Adult Learners

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Individualized and intelligent learning support based on personality measure is becoming an important research area in distance education. Here we introduced a related research, the online guidance system of learning style and learning strategies for Chinese distance adult learners. In this research, we firstly developed a learning style questionnaire for Chinese distance learners, so as to help them to find out their own learning style type. Secondly we created a learning strategies database and then developed a strategy questionnaire. Thirdly we studied the relationship between the learning style type and learning strategies. And finally we designed and developed the online learning strategies guidance system based on the relationship. The study used surveys and interviews for gathering data and developing the online guidance system of learning strategies.

Introduction

In recent years, distance education in china developed rapidly and encountered many difficulties at the same time. How to provide learning support for massive students based on their personality characters is one of the difficulties. While research based literature on the subject of institutional support for distance learners is limited (Koble & Bunker, 1997). Most distance education institutions have not yet made genuine adaptations in student services to meet distance learners' needs (Jackson, 2000; Krauth, 1999). A central principle from which practice can be guided in this area, however, is the concept of meeting the distance learner's needs and expectations - a learner-centered philosophy (Granger & Benke, 1998; Jackson, 2000; Thompson, 1998).

Adult learners are heterogeneous with different goals, affective characteristics, demographic characteristics, situational characteristics and so on (Schlossberg et al., 1989). Among these, learning style is one of the characteristics the researchers focused on. Learning styles are various approaches or ways of learning. Most people prefer an identifiable method of interacting with, taking in, and processing stimuli or information. Based on this concept, the idea of individualized "learning styles" originated in the 1970s, and acquired "enormous popularity" (Pashler, H., 2008).

Another learner characteristic is learning strategy which researchers focused on and also is closely related to learning result. The level of learning strategies is an important dimension in measuring an individual's learning capability, and also one of critical factors that restricts learning effects (Liu, D., & Huang, X., 2002). Strategies are the often conscious steps or behaviors used by learners to enhance the acquisition, storage, retention, recall, and use of new information (Rigney, J. W., 1978). Research indicates that learners at all levels use strategies, but some are relatively unaware of those they use. More proficient learners appear to use a wider range in a greater number of situations than do less proficient learners, but the relation between strategy use and proficiency is complex. Research also suggests that learning styles, learning strategies, and language learning aptitude might bear a close relationship (Ehrman, M., 1988, 1990; Oxford, 1989; Parry, T., 1984; Willing & Kenneth, 1988). Min Liu and W. Michael Reed (1994) studied the relationship between the learning strategies and learning styles in a hypermedia environment and found that different learning style groups employed different learning strategies in accomplishing the same task. The results of the study indicated that the hypermedia technology has the potential to accommodate learners with different needs through its rich environment.

Proponents say that teachers should assess the learning styles of their students and adapt their classroom methods to best fit each student's learning style, which is called the "meshing hypothesis (that

a student will learn best if taught in a method deemed appropriate for the student's learning style)" (Dunn, R, 1978; Sprenger, M., 2003). The efficacy for these proposals are extensively proved (Ronchetto, J. R., Buckles, T. A., Barath, R. M., & Perry, J., 1992; Tom, G., & Calvert, S., 1984; William & Carl, 1996).

The challenge, however, is that distance education is offered in many different forms to many different types of learners. Therefore, identifying distance learners' characteristics and needs and applying these data to build services and programs is problematic (Clark, M., 2004). In order to resolve these problems, we should rely on the psychological measuring tools and intelligent support technology. The purpose of the research was to develop an individualized and intelligent guidance system of learning strategies based on personality measure aiming to provide learning strategies support for Chinese adult learners suitable to their learning styles and so as to improve their learning achievement using intelligent technology.

The Research Process

The research included 4 processes:

The Survey on Learning Style for Chinese Distance Learners

In this study, we firstly developed a learning style questionnaire for Chinese distance learners, so as to help them to find out their own learning style type. By literature research we developed a Three-dimensional model covering the physical, social and mental dimensions which is based on Information Processing Theory, Kolb's Theory of Experiential Learning and Myers Briggs' Personality Categories Model (Li Chen, Weiyuan Zhang, & Dan Hao, 2005) as the Table 1 showed.

Table 1. *The Three-Dimension Model of Learning Style*

Dimensions	Physical dimension	Social dimension	Mental dimension
Theoretical Basis	Information Processing Theory	Kolb's Theory of Experiential Learning	Myers Briggs' Personality Categories Model
Point of view	Sensory channel preference	Learning style preference	Personality characteristics
Category	Visual Auditory Tactile & kinesthetic	Investigatory Experiential Communicative Apprehensive	Introvert/Extrovert Rational/Emotional Planning/Flexible Realistic/Imaginative

Based on the model we developed a draft questionnaire. After pre-survey, test-retest and factor analysis, the final scale uses a 5-point Likert-type scale of "Strongly agree" (5 points), "Agree" (4 points), "Neutral" (3 points), "Disagree" (2 points) and "Strongly disagree" (1 point) (Li Chen, WeiYuan Zhang, & Dan Hao, 2005).

Table 2. *Dimensions of Learning Style Questionnaire*

1st-level dimensions	2nd-level dimensions
physical dimensions	visual auditory tactile and kinesthetic
mental dimensions	introvert/extrovert rational/emotional planning/flexible
social dimensions	investigatory experiential communicative apprehensive

Test-retest reliability and internal consistency of the scale were calculated. The test-retest coefficients for physical, mental, social dimensions and the overall scale are 0.85, 0.86, 0.78 and 0.85 respectively; α coefficient for above 4 domains are 0.73, 0.85, 0.74 and 0.90 respectively.

The questionnaire contains 104 items covering three 1st-level dimensions, and each 1st-level dimension is composed of different 2nd-level dimensions as presented in Table 2. The participants of this study were distance learners from E-college in China. We took the survey by both paper-and-pencils measuring and online measuring. A total of 1,384 questionnaires were received, of which 1,256 questionnaires were valid (response rate of 91.4%). The demographic characteristics of the survey sample are presented in Table 3.

Table 3. *The Demographic Characteristics of the Survey Sample*

Characteristics		Number
disciplines	arts	1,158
	science	107
region	Northeast	63
	North china	247
	East china	395
	South china	383
	Central china	97
	Northwest	43
	Southwest	94
gender	male	529
	female	736
entrance level	high school	589
	academy	733
age	<25	514
	26~35	598
	>36	153
working duration	< 1 year	188
	2~5 years	347
	6~10 years	360
	>10 years	370
The total		1,265

In the study, we investigated the characteristics of Chinese distance learners' learning styles from the disciplines, gender, working duration, and so on.

The general characteristics of learning styles of Chinese distance learners. We compared the result with national norm and found that the general characteristics of learning style of distance learners in the three dimensions in China were as followed:

Physical dimension: visual, auditory, tactile and kinesthetic. Comparing with the national norm, the scores of three physical dimensions were significantly higher, and the differences were significant.

It meant that the general characteristic in the physical dimension of the Chinese distance learners was not single, but sensitive to perceptual, visual and auditory at the same time.

Mental dimension: introvert/extrovert, rational/emotional, planning/flexible. In mental dimension, the Chinese distance learners preferred not only reading, noting, repeating but also investigating and practicing.

Social dimension: investigatory, experiential, communicative and apprehensive. The types of the learning style in social dimension were consistent with the working duration. Because most of the adult distance learners had higher level of socialization with working experience of 2 to 10 years, they were good at exchanging each other and practicing the experience in the new learning environment. Accordingly, they preferred cooperative learning in distance learning.

Working duration difference in learning style. Analysis of variance was carried out to investigate the above results further. The subject factors in the ANOVA was working duration less than 1 year, 2 to 5 years, 6 to 10 years, and more than 10 years. This analysis showed that there were significant differences in the five learning styles (Investigatory, Comprehensive, Rational, Emotional and Flexible) among the distance learners with different working duration. The characteristics of distance learners with working experience of more than one year were researching and understanding. The distance learners who have longer working experience preferred to Rational style, and vice verse. The distance learners working less than 1 year showed the strongest characteristics of flexible style.

Entrance levels difference in learning style. In order to investigate the influence of entrance levels, one-way ANOVA was carried out on the learner levels. There were two levels in our subjects (high school, academy). The results showed that there were significant differences in Investigatory and Flexible style. The distance learners from academy preformed more features of these two types of learning styles than the learners from high school.

Discipline difference in learning style. To examine the learning style differences in discipline, we conducted variance analysis to compare arts with science. We found that distance learners in arts and science had significant differences in Investigatory style, Communicative style, Rational style, and Introvert style. The learning style of distance learners in the arts were Communicative, and in the sciences were Investigatory, Introvert, and Rational style. Accordingly, to examine the learning style differences further in sex and age, we conducted separate ANOVA for each discipline.

Gender difference in learning styles of the arts and the science learners. We conducted ANOVA to examine the gender differences in each discipline. The results showed that arts students showed significant gender differences in six learning style types including Visual, Auditory, Investigatory, Introvert, Rational and Emotional style. The arts boys performed more features of Investigatory, Introvert, Rational style. However, the arts girls had more features of Visual, Auditory and Emotional style. The science students showed significant difference only in Tactile & Kinesthetic style. Science boys showed more Tactile & Kinesthetic features than Science girls.

Age difference in learning styles of the arts and the science learners. We carried out ANOVA to investigate the learning style differences in age for the arts and the science students. We found there was significant difference in six learning style types including Comprehensive, Visual, Auditory, investigatory, Rational, Emotional and Flexible style. Table 4 shows the details of their learning style preferences.

Table 4. *Age Difference in Learning Style Preference*

Discipline	Age	Preference
arts	<25-year-old	Emotional, Flexible
	26~35-year-old	Visual, Auditory, Investigatory, Comprehensive, Rational
	>36-year-old	Investigatory, Comprehensive, Rational
science	<25-year-old	Visual, Auditory
	26~35-year-old	Visual, Auditory, Experiential
	>36-year-old	Visual, Auditory, Tactile & Kinesthetic, Experiential

The Establishment of Distance Learning Strategies Database

Secondly we established a learning strategies database and then developed a strategy questionnaire. The process included 4 steps as follows:

The collection of learning strategies. By literature research we made certain the taxonomy of learning strategies: cognitive strategy, meta-cognitive strategy, affective strategy and resource management strategy. And then we collected strategies as much as possible via literature, questionnaire and interview etc. In this step we collected 235 learning strategies.

The selection of learning strategies. To ensure the applicability of the learning strategies, we selected the strategies collected before according to the characteristics of adult learners and the difficulties in distance learning. After selection, the learning strategies were reduced to 193.

The regularization of learning strategies. Because the learning strategies collected before came from a wide variety of sources, and the representation was also many and various. We regulated the learning strategies as follows: (1) naming the learning strategies; (2) explaining the learning strategies; (3) specifying the conditions; (4) identifying the implement steps. After regularization, we divided the learning strategies into 4 categories, and each includes different sub-categories as Table 5 showed.

Table 5. *The Category and Sub-category of Learning Strategy*

category	sub-category
cognitive strategy	information memory strategy information processing strategy information organization strategy
meta-cognitive strategy	planning strategy regulating strategy monitoring strategy evaluating strategy
affective strategy	emotion management strategy motivation stimulation strategy
resource management strategy	environmental management strategy human resource strategy time management strategy

The establishment of learning strategies database. We constructed a learning strategies database with 193 learning strategies, 4 categories including 46 cognitive strategies, 51 meta-cognitive strategies, 45 affective strategies and 51 resource management strategies.

In the database, we added the applicable time of the strategies used. We divided the distance learning into 4 periods: the preparation period, the early period, the middle period and before exam (Li Chen &   Jing Gong, 2005).

The learning strategies database stored the content as followed. (1) The title of the strategies; (2) the explanation for the strategies; (3) the implement steps of the strategies; (4) the category and sub-category the strategies belonged to; (5) the applicable time of the strategies used. For example:

Table 6. *The Example of the Learning Strategies Database*

Title	Explanation	Category	Sub-category	Applicable time
Open commitment	Open commitment will direct future action. You will perform better when you promise that you will complete the task.	Meta-cognitive Strategies	Monitoring Strategies	The early period of distance learning

Matching the learning style with learning strategies. In this process we studied the relationship between the learning style type and learning strategies. Firstly we developed a strategy questionnaire based on learning strategies database. With the learning strategy questionnaire and learning style questionnaire, a simultaneous questionnaire survey on learning style and learning strategies was

conducted among 500 distance learners in China by randomly cluster sampling.

The analysis of questionnaire mainly used the software of SPSS, descriptive statistics method. We analyzed frequencies to make sure the same learning style of distance learners preference for learning strategies, and on this basis, we established the matching between learning style and learning strategies for distance learners in China.

Figure 1. The main interface

The Development of the Online Guidance System of Learning Strategies for Chinese Adult Learners

In this process, we designed and developed the online guidance system of the learning strategies based on the matching relationship constructed before. This system helps adult learners know their learning style characteristics, and on this basis gives the learning strategies guidance adapt to their learning style. The adult learners log in the online guidance system and fill in the learning style questionnaire. And then they can receive particular guidance to know their own strengths and weaknesses, and the learning strategies suggestion suitable to their learning style. Consequently the adult learners can master the learning strategies in line with the learning style preference and deal their study better.

Figure 2. The interface of the learning style questionnaire

Figure 3. The interface of the characteristics of learning style

Conclusion

The online guidance system of learning strategies is an attempt of the individualized and intelligent learning support based on personality measure of our research center and has been used in many E-colleges in China for 4 years.

We have investigated the application of the learning strategies recommended by the online guidance system. We used descriptive statistics to analyze the frequency and effectiveness of the strategies used by distance learners. The result showed the overall utilization rate and effectiveness of the strategies of the distance learners is general. They use cognitive strategy best, but resource management strategy worst. Most distance learners said that the 4 types of strategies, especially the cognitive strategies, were used and effective for their learning.

We also analyzed the frequency and effectiveness of the strategies of sub-categories. We found that the information memory strategies, monitoring strategies and motivation stimulation strategy had the highest utilization rate and worked best.

Through the analysis, we also found some distance learners have high expectations for the strategies they never used such as human resource strategies and information organization strategies.

We will continue to track and evaluate the effectiveness of the strategies recommended by the online guidance system and evaluate the match between learning style and learning strategies.

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