

Self-regulated learning ability of Chinese distance learners

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Abstract

This study reports on self-regulated learning (SRL) of Chinese distance learners by using a structured SRL scale. SRL of adult and lifelong learners is a well-researched area, though its application within distance education is a new area of investigation. Open and distance learning lean heavily on self-learning and self-learning resources, though interaction at designated learning centers and online learning platforms is occasionally offered. In China, there is still persistence of the age-old teacher-centric model of teaching-learning; and, within distance education offered largely by the radio and television universities, there is insistence for regular tuition classes at designated branch schools. At the backdrop of understanding and enhancing SRL of Chinese distance learners, the authors took up this research to find out the elements and levels of SRL ability among Chinese distance learners. Based on factor analysis (on 357 students for item analysis and on 600 distance learners for structural validity of the initial 117-item scale), a standardized 54-item Self-regulated Learning Ability Scale was finalized and administered on a random sample of 2738 undergraduate learners (1630 males and 1108 females) from the Open Distance Education Centre of Beijing Normal University, P.R. China, doing an online course during 2009–10. The sample came from either senior high school (grade 12) or junior college (grade 14). Data on four dimensions of SRL—planning, control, regulating and evaluation—were analyzed using 't' test for variables of gender, level of education and age. Results indicated that all the participants had above-average levels of SRL in all the four dimensions of planning, control, regulating and evaluation. In so far as gender was concerned, male distance learners were better in SRL than female distance learners, especially in control (ie, content and resources) and all the evaluation dimensions. Though no age difference was found, students from junior colleges had better planning, regulating and evaluating abilities than those who came from senior high schools. These results have been discussed in the context of current changes in Chinese distance/online education and also in relation to the age-old Chinese culture of learning. The results will also have implications for designing distance and online learning generally.

Practitioner Notes

What is already known about this topic

- The earlier studies on self-regulated learning (SRL) focused on how learners learn and how they plan, monitor, regulate and adopt strategies for effective self-learning. The most widely used model of SRL is that of Zimmerman (1990, 1998, 2000), which focused on explaining the relationship of three dimensions of self-regulated learning: metacognition, motivation and behavior from a social cognitive perspective.
- Research studies on the application of SRL in the context of distance education are limited. The few existing studies suggested three important dimensions of planning, monitoring and regulating, which facilitated self-learning. Rarely, the studies considered second-level dimensions to the first level factors (as noted above), which could further contribute to understanding the role of SRL in the context of distance learning that heavily depends on independent self-study.
- The earlier Chinese studies on SRL formulated planning, regulation, evaluation and feedback as the four dimensions found in their sampled learners; and for distance learners, regulation was found to be the most important factor in SRL and that SRL and academic achievement were positively related. Moreover, previous research showed that though the learners had some basic SRL abilities, they could not put them into use in order to adapt to distance learning (Xiaochun, 2004).

What this paper adds

- The research results reported in this paper standardized the SRL abilities based on the Zimmerman model from a social-cognitive perspective, and considered, through factor analysis on a large sample size, four first levels of SRL abilities (ie, planning, control, regulating and evaluating) and three second-level abilities (ie, controlling resources, controlling content and controlling results) for each of the four first levels. The specially standardized scale was validated on both distance and online learners, before administration on a separate large sample of adult distance learners in China.
- The four first-level and three second-level SRL abilities were studied as a whole and separately and also in relation to gender, age and stream of entry to distance learning courses.
- This paper suggested that: (1) generally, the average scores of SRL abilities of Chinese distance learners were above the midpoint on the 5-point scale, though learners generally lacked the ability of controlling learning resources like study materials, tutors, and method of teaching; (2) gender differences exist in SRL abilities—though both male and female learners were equal in planning and regulating, and controlling results, the female learners lacked abilities of control and evaluation, and controlling content and resources; (3) though no age difference was noted, there were differences at the entry to distance study by junior high school graduates and junior college graduates—though both could identify properly the tasks to be studied, the latter were better in planning, regulating and evaluating abilities.

Implications for practice and/or policy

- The implication for distance education is that distance learners generally may have above-average SRL abilities that need to be identified, and the design of instruction and tutorial and other learner supports need to be based on such abilities in each institutional cohort of distance learners.

- The design and delivery of distance learning need to consider gender as a very important variable. Although the female learners had equal abilities of planning and regulating as also controlling results, they were lagging behind in control and evaluation, and content and resources. Once nurtured, these can influence their ability of controlling results. Given the above, therefore, if the female learners are facilitated to depend less on the tutors and their teaching methods, and enhance their SLR abilities in general and control and evaluation skills in particular, they could surpass their male counterparts in influencing their results. This calls for reevaluation of the overall policy of designing distance and online learning in the open universities, and radio and television universities, as also the online colleges/programs.
- These findings are to be seen in relation to the male-dominated and teacher-dependent teaching-learning tradition of Chinese education and more so distance education. Although the SRL abilities are found to be above average in the sampled distance learners, these are not nurtured in favor of the students to take charge of their own learning, occasional student–tutor and student–student interactions notwithstanding. The entire group was found to be lower in the ability of regulating learning resources as the learning materials, tutors and their teaching methods were beyond their control/influence. There is, therefore, the need to redesign especially the resources (ie, materials, tutors, teaching methods) so as to facilitate and also strengthen the SRL abilities of distance and online learners. This also involves provision for individualized learner support for especially meta-cognitive abilities, self-pacing and self-study, planning of resources and organizing future career.
- Therefore, further research is needed on: (1) how and why distance and online learners use specific SRL abilities and how they influence their learning outcomes/achievements; and (2) other radio and television/open universities in China to strengthen the area of self-regulated learning.

Introduction

Self-regulated learning (SRL) has been a well-researched area in many educational and cultural contexts, though its exploration within distance education and with reference to Chinese distance learners remains limited. This research paper explores SRL among Chinese University distance learners and draws implications for organizing distance learning vis-à-vis the traditional culture of learning in China.

In SRL, learners take an active role in improving their knowledge and ability while learning. Past research studies underline diversified viewpoints about SRL. According to Paris and Paris (2001), “Self-regulated learning (SRL) as the three words imply, emphasizes autonomy and control by the individual who monitors, directs, and regulates actions towards goals of information acquisition, expanding expertise, and self-improvement” (p 89). Pintrich (2000) stated self-regulated learning as “an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation, and behavior, guided and constrained by their goals and the contextual features in the environment”(p 453).

Simons and Vermunt (1986) defined self-regulated learning as a process of self-education, including orientation, planning, execution, monitoring, directing, testing, reflecting and evaluation. Bandura (1986) described self-regulated learning as an individual’s use of three cognitive processes towards goal attainment: self-monitoring, self-judgment and self-reaction. Theories and models of self-regulated learning have emerged in the recent past to describe what successful self-regulated learners do (Bandura, 1986; Boekaerts, Pintrich & Zeidner, 2000; Andrade & Bunker, 2009; Zimmerman, 1998, 2000).

Winne and Hadwin's model of self-regulated learning (quoted in Greene and Azevedo, 2007) was rooted in the information processing theory and emphasized the monitoring and control aspects within each phase of learning and separation of task definition and goal setting into separate phases. Winne and Hadwin put forward four stages of self-regulated learning: (1) define the task and set goals; (2) plan; (3) enact strategies to reach those goals; and (4) self-monitoring. Zimmerman (1990), whose theoretical framework has been considered for this research study, specified three important characteristics of self-regulated learning: (1) systematic use of meta-cognitive, motivational and behavioral strategies; (2) a 'self-oriented feedback' loop in which learners monitor the effectiveness of their learning method or strategies and react to this feedback; and (3) an indication of how and why learners choose to use a particular strategy or response. Zimmerman (1998, 2000) described a cyclical model of SRL from a social cognitive perspective that included: forethought, performance and self-reflection. Each of the stages involved cognitive strategies and motivational belief.

Distance education is a field of education that focuses on the application of educational technology and technology mediation with the aim of delivering teaching, largely often on an individual basis, to learners who are not physically present in a traditional educational setting such as a classroom. It has been described as "a process to create and provide access to learning when the source of information and the learners are separated by time and distance, or both" (Honeyman & Miller, 1993, p 67).

In distance education, on account of the separation of the teachers and students in space and/or time, and due to the practice of studying the pre-produced course, it is important to resort to a variety of media technologies to achieve the reintegration in teaching and learning and to reestablish interaction. Distance learners need to be capacitated to be able to use the self-learning text, audio-video materials, computer-assisted courseware and other instructional resources provided by distance learning institutions for self-learning. Besides, distance learning institutions and teachers provide the required learning support services through a variety of means, including face-to-face counseling and online counseling, among others. Thus, distance education is a highly learner-centered mode and involves self-regulated learning. Learner autonomy and self-regulated learning are the most prominent features in distance education. Distance learners generally take responsibility for their own learning (Dembo & Eaton, 2000; Holec, 1981; Vanijdee, 2003; White, 2003), and they should determine their learning goals, how to accomplish those goals, how much to learn and create a learning plan, select resources that support self-study, monitor the learning process, and evaluate the learning results. So, self-regulated learning in distance education involves the cyclical processes of self-planning, self-monitoring, self-regulating and self-evaluating one's learning and behavior with the support from distance learning institutions and distance teachers in an open environment and mediated through various technologies.

In the People's Republic of China, a few studies conducted on self-regulated learning suggested it to involve three components: (1) planning the learning activities in advance; (2) monitoring actual learning activities, evaluating them and giving feedback; and (3) regulating and controlling the learning behavior (Guowei, 2003). The Chinese studies suggested the features of self-regulated learning should be expressed in the following aspects: planning, regulation, evaluation and feedback by the learners. Based on the above literature, in the present research on distance learners, we formulated self-regulated learning as the cyclical processes of self-planning, self-monitoring, self-regulating and self-evaluating one's learning and behavior, while studying at a distance, and with occasional interaction with the tutor.

Early research studies have shown that self-regulation helps learners reach their full potential (Risemberg & Zimmerman, 1992). Pintrich (2000) found that students who employed

self-regulated, self-determined approaches to learning achieved more and were more satisfied in their work. It was also pointed out that traditional learning experiences do not prepare students for the high degree of self-regulated learning and control required in especially web-based courses (Brooks, Nolan & Gallagher, 2001; Hartley & Bendixen, 2001).

Chen (2002) investigated effective SRL strategies of Chinese learners in different learning environments using the Motivated Strategies for Learning Questionnaire (developed by Pintrich *et al.*, 1991, at the University of Michigan) and found that regulation had a positive effect on learning computer concepts. It was also believed that self-regulation was particularly important when learning in web-based environments (Shen, Lee & Tsai, 2008; Winnips, 2000; Zimmerman & Martinez-Pons, 1986). Ying (2005) investigated self-regulated learning of the distance learners from the School of Distance Learning of Beijing Foreign Studies University and found that self-regulated learning and academic achievement had a positive relationship. Dayong (2007) found that most distance learners in the Tangshan region of China were incompetent in self-regulated learning. Xiaochun (2004) also surveyed the SRL of 2000 distance learners in the Shandong province concerning motivation, planning, learning method, usage of leaning resources and learning evaluation. The result showed that the SRL ability was developed unevenly and that though the distance learners had some basic self-regulated learning abilities, they could not put them into use in order to adapt to distance learning.

Research questions

Not much research is available on SRL in the context of distance education and especially in respect of Chinese distance learners. What does SRL look like in distance education, ie, what are the general characteristics of self-regulated learning ability of distance learners? Do the previous research findings on SRL suit the context of distance education? Are there gender, age and entrance level differences in the SRL ability of distance learners? The purpose of the present research was to identify the elements of SRL in the context of distance education and explore the level of those elements of SRL of Chinese distance learners. These research questions were formulated at the backdrop of the traditional teacher-centric model of Chinese education in general and the regular tuition model of branch school classes of radio and television universities in particular, as also in schools of distance learning in traditional universities (in this case, Beijing Normal University from which the student sample was drawn).

Methodology

The survey instrument

The current study used the survey method to investigate the SRL characteristics of Chinese distance learners using the Self-regulated Learning Ability Scale for the Chinese Distance Learners (SRAS) developed by the researchers.

The study involved a three-phase approach to validate the survey scale on SRL for Chinese distance learners. During phase 1, the scale was developed and reviewed by a team of experts; in phase 2, an item analysis was conducted; and in phase 3, a statistical analysis of reliability and validity of the survey instrument was carried out.

Phase 1: Development of SRAS

According to social cognitive theory, SRL refers to learning that results from students' self-regulated thoughts and behaviors that are systematically oriented towards the attainment of their learning goals (Zimmerman, 1998). Bandura (1986) postulated that self-regulation involved reciprocal interaction among behaviors, environmental variables and personal variables. Students' self-regulated learning are not only determined by personal factors but also influenced by environmental and behavioral events in reciprocal fashion (Zimmerman & Schunk, 2001). Learners can actively monitor and regulate not only the inherent learning processes but

also the external behaviors and learning environment on the basis of external feedback. In the social cognitive theoretical framework, self-regulation is highly context dependent. Learners engaged in self-regulation in different domains, and they should understand how to adapt self-regulated learning processes to specific domains (Zimmerman & Schunk, 2001). There are six areas in which one can use self-regulatory processes: motives, methods, time, outcomes, physical environment and social environment (Zimmerman, 1998). These six areas describe the task conditions of self-regulated learning: choosing to take part; choosing the method or strategies; controlling the time; controlling the learning result; controlling the physical environment; and controlling the social environment. Self-regulation is determined by the extent that learners engage in the six areas. If learners can choose or control all these six task conditions themselves, their learning is self-regulated, and vice versa.

Based on the social cognitive theory and pervious conceptualizations of SRL, we considered SRL as the cyclical processes of self-planning, self-monitoring, self-regulating and self-evaluating one's cognition, behavior and environment, of which self-monitoring is the most important component (Zimmerman & Paulsen, 1995). In the social cognitive theoretical framework, self-regulation is constructed as situation specific (Zimmerman & Schunk, 2001). So the learners engage in the above self-regulatory processes in five aspects: learning objective, learning content, learning strategy, learning resources and learning results. When students could take initiative to plan, control, regulate and evaluate their learning objective, content, strategy, resources and results, their learning was supposed to be self-regulated.

Based on the above, we developed a scale of SRL that consisted of four first-level dimensions: self-planning, self-monitoring, self-regulating and self-evaluating. Each first-level dimension contained five second-level dimensions—the second-level dimensions referred to the process of self-regulated learning (ie, further explanation to the first level dimensions), which included five aspects: learning objective, learning content, learning strategy, learning resources and learning results (Table 1).

Table 1: Theoretical dimensions of self-regulated learning for distance learners

<i>First-level dimensions</i>	<i>Explanation of first-level dimensions</i>	<i>Second-level dimensions</i>
Planning capability	Recognize their own cognitive abilities, strategies and cognitive tasks and make a plan before the tasks are under taken.	Learning objective Learning content Learning strategy Learning resources Learning results
Control capability	Identify the task, and monitor, control, predict the progress of cognitive task.	Learning objective Learning content Learning strategy Learning resources Learning results
Regulating capability	Allocate resources, make regulatory decisions on the steps and process of cognitive task.	Learning objective Learning content Learning strategy Learning resources Learning results
Evaluation capability	Evaluate the result of cognitive task, reflect on the plan, control and regulate the task and inspire future learning motivation.	Learning objective Learning content Learning strategy Learning resources Learning results

Based on the above framework and survey of SRL from the literature, the research team developed the item pools of 119 items in Chinese (and equivalent English). These items were further reviewed by a group of experts from the fields of education, education technology and psychology for clarity and completeness to ensure content and face validity. The 119-item scale covered four first-level and five second-level dimensions, and the 5-point Likert-type scale suggested “*strongly agree*” (5 points), “*agree*” (4 points), “*neutral*” (3 points), “*disagree*” (2 points) and “*strongly disagree*” (1 point). The SRAS included 29 items for planning capability, 32 items for control capability, 24 items for regulating capability and 34 items for evaluation capability.

Phase 2: Item analysis

In this phase, factor analysis was carried out on the 119 items in the scale. Exploratory factor analysis and confirmatory factor analysis (CFA) methodologies were followed to analyze the 119 items of SRAS (adopting the Likert 5-point scoring method).

Participants. Three hundred fifty-seven students were selected randomly from about 7,000 students in Wenzhou vocational technical college situated in Wenzhou province of China. The vocational college was selected since the postsecondary students of this college took online courses and received monthly face-to-face counseling for hands-on counseling. Of the total administered 357 questionnaires, 215 valid ones were retrieved back with an effective response rate of 60.2%.

Procedure. First, based on the Pearson’s coefficient of correlation, 10 items belonging to second-level dimensions were deleted as having a value below 0.2. Moreover, second, we extracted, with the help of principal components analysis, four first-level dimensions (planning capability, control capability, regulating capability and evaluation capability) and three second-level dimensions (learning content, learning resources and learning result) (Table 2). In order to assure the item differential validity, we deleted the items according to the following standard: (1) factor loading value below 0.3; (2) with multiple loading; (3) the numbers of items in each second-level dimension less than 3; and (4) improper item classification.

Findings. The three second-level dimensions extracted by exploratory factor analysis included learning content, learning resources and learning result. ‘Learning resource’ was the general term for learning materials, and method of teaching-learning for supporting and improving learning for distance learners. ‘Learning content’ referred to the knowledge, skill and behavior that need be developed in the distance learners. ‘Learning result’ referred to the sum of academic knowledge and skills achieved by distance learners.

Table 2 shows that all the factor loading values were greater than 0.4. Principal component analytical results (Table 3) indicated that the eigenvalues of three principal components in the four first-level dimensions were all above 1. The accumulative contribution rate of components separately accounted for 86.424% in planning dimension, 88.281% in control dimension, 83.988% in regulating dimension and 82.246% in evaluating dimension, which all provided above 80% accumulative contribution. All these results indicated the reliable and valid structure of the scale. After factor analysis, the final scale contained 54 items covering four first-level dimensions (planning, control, regulating and evaluating) and each comprising of three second-level dimensions (learning content, learning resources and learning result). The final scale included 11 items for planning capability, 13 items for control capability, 14 items for regulating capability and 16 items for evaluation capability.

Phase 3: Scale reliability and validity

During phase 3, we carried out a retest to conduct the reliability analysis and CFA on the final scale of 54 items.

Table 2: The dimensions of SRAS

<i>First-level dimensions</i>	<i>Second-level dimensions</i>	<i>Factor loading</i>
Planning capability	<i>Learning resources</i>	
	83. I try to locate the materials of a lesson before learning it.	0.956
	98. Before distance learning, I login into the teaching platform or the program website to experience various functions.	0.776
	82. I select suitable study method in line with my own characteristics.	0.751
	107. I try to be familiar with the learning support services offered by distance education institutions before taking up distance learning.	0.448
	<i>Learning content</i>	
	2. Before learning, I usually choose the learning content according to my own knowledge level and technology skills.	0.601
	3. I choose the effective learning method purposefully according to the learning objectives and content.	0.951
	61. I always set learning goals based on my background of knowledge and learning contents.	0.511
	62. I choose learning content flexibly according to the learning goals set.	0.440
	<i>Learning results</i>	
	24. I choose the place of learning in advance to obtain good learning effect.	0.873
	25. I predict my performance according to the difficulty of the learning content at the beginning of my distance learning.	0.777
	45. I consider the evaluation method of learning outcomes at the beginning of my distance learning.	0.786
	Control capability	<i>Learning resources</i>
68. I always think the effectiveness of my learning methods during my distance learning.		0.722
100. I make sure to follow the preset schedule from time to time during my distance learning.		0.574
109. I reflect whether there is any problem with my way to seek help when I have any unsolved problems.		0.784
113. I consciously check whether the used learning materials are helpful.		0.875
115. I communicate with teachers and students to judge whether the learning materials are effective.		0.841
<i>Learning content</i>		
47. I try to find out and re-read the content which I haven't understood thoroughly.		0.723
49. Even if there is my favorite show on the TV when I am doing my distance learning, I insist on my learning rather than watching TV.		0.993
50. In distance learning, I usually reflect on how to improve my academic performance.		0.826
<i>Learning results</i>		
7. In the process of distance learning, I check my mastery of the learning materials from time to time.		0.570
10. I check the quality of my homework or learning tasks by self-examination.		0.544
27. I always pay attention to whether I actually understand the content I am learning.		0.451
29. I supervise myself to accomplish the learning tasks on time during my distance learning.		0.761
89. I rarely pay attention to my learning outcomes.	0.814	
Regulating capability	<i>Learning resources</i>	
	54. I sacrifice a part of my leisure time in order to complete the learning tasks.	0.720
	71. If the content is difficult to understand generally, I use variety of method to re-study and re-understand the content.	0.547
	73. I usually ignore it and continue to learn, when something interferes with my environment.	0.675
	74. After a period of distance learning, I will adjust the reward and punishment measures, which were set for myself in advance, according to the actual learning situation.	0.649
	92. After a period of study, I take up add new learning materials according to my studies and the suggestions of others.	0.665
	102. Even if not required, I do exercises/activities given in the course units.	0.569
	<i>Learning content</i>	
	12. I adjust the sequence of learning tasks according to actual learning during my distance learning.	0.543
	14. I adjust the learning schedule according to the mastery of learning content.	0.758
32. I choose some easier content to learn when I feel tired.	0.583	
103. I try to use other ways to seek help while facing unsolved problems.	0.543	

Table 2: Continued

First-level dimensions	Second-level dimensions	Factor loading
	<i>Learning results</i>	
	13. I adjust my learning method according to my performance during my distance learning.	0.776
	15. In case of falling behind in my learning achievement, I take initiative to play down the expectation of learning outcome.(and vice versa)	0.648
	35. After a period of learning, I adjust my expectation of the learning outcomes actively according to the suggestion of teachers and students.	0.741
	55. In distance learning, I adjust the initial evaluation methods of my learning outcomes according to the actual learning.	0.524
Evaluation capability	<i>Learning resources</i>	
	111. I usually evaluate my judgment of the effective learning materials.	0.692
	112. In my distance learning, I evaluate the adjustment of the evaluation methods of my learning outcomes.	0.781
	114. I often evaluate my help seeking ways to solve academic problems before I actually seek help.	0.587
	116. I evaluate the time consumed after completing each learning task.	0.850
	117. In distance learning, I usually evaluate the effect of my adjustment to the interference factor in the learning environment.	0.718
	119. At the end of semester, I evaluate my previous help seeking strategies to see if I have made improvement.	0.801
	<i>Learning content</i>	
	37. At the end of every semester, I think if I have clear judgment of the mastery of learning content.	0.425
	39. After a period of study, I evaluate the suitability of the schedule according to the actual learning.	0.671
	57. I always reflect whether I adjust my learning content each day or each week according to actual learning.	0.681
	58. I evaluate the validity of my learning method according to the mastery of learning content during my distance learning.	0.760
	76. I always check if I adjust the sequence of the content according to actual learning.	0.629
	79. I evaluate the accuracy of the quality of my performance at any time during my distance learning.	0.842
	<i>Learning results</i>	
	17. I often reflect on whether my daily or weekly learning plans are reasonable.	0.786
	18. At the end of study, I evaluate the effect of my learning methods and strategies which I used.	0.838
	20. I evaluate my learning outcomes at the end of each semester.	0.545
	40. At the end of each semester, I evaluate the expectation of learning results that I set at the beginning of the semester.	0.591

Participants. The items were administered to 600 distance learners randomly selected from 8,000 learners studying undergraduate courses in 2009–10 at the National Centre for Open and Distance Education (located in Beijing, and offering learner support service to distance learners all over China).

Procedure. First, the Cronbach's alpha coefficient for the scale was calculated for all the four first-level dimensions for establishing reliability of the scale (Table 4).

Table 4 shows that Cronbach's alpha of the whole scale and each dimension ranged from 0.79 to 0.96. The internal consistency of the items was analyzed by using the split-half reliability coefficient, which was 0.91.

Second, two level dimension constructs were testified in the CFA by using AMOS 6.0 (SPSS, Chicago, IL, USA) to examine structural validity (Table 5).

Table 5 shows that the score of X^2/df (test of goodness of fit) was greater than 2 and less than 5. Normed fit index value of 0.679, comparative fit index value of 0.803, incremental fit index value

Table 3: Scores on variance contribution

First level	Second level	Eigenvalues	% of variance	Accumulative %
Planning	Resource	4.438	47.348	47.348
	Content	1.206	20.967	68.315
	Result	1.002	18.108	86.424
Control	Resource	5.294	48.727	48.727
	Content	1.323	20.174	68.901
	Result	1.089	19.380	88.281
Regulating	Resource	5.317	47.979	47.979
	Content	1.236	18.830	66.809
	Result	1.005	17.179	83.988
Evaluating	Resource	7.802	48.764	48.764
	Content	1.146	17.163	65.927
	Result	1.011	16.319	82.246

Note: % of variance: variance contribution rate; accumulative : accumulative contribution rate.

Table 4: Cronbach's alpha coefficient

Dimension	Cronbach's alpha
Planning	0.84
Control	0.82
Regulating	0.79
Evaluating	0.91
Total scale	0.96

Table 5: Structural validity analysis

χ^2/df	NFI	CFI	IFI	RFI	RMSEA
2.053	0.679	0.803	0.805	0.794	0.051

of 0.805 and relative fit index value of 0.794 were close to or greater than 0.8. Root mean square error approximation (RMSEA) value of 0.051 was found to be 0.05. The final Scale of Self-Regulated Learning Ability (ie, SRAS) demonstrated adequate internal consistency and satisfactory structural validity and was found suitable for rating the self-regulated learning ability of Chinese distance learners.

Population and sample

The study concentrated on distance learners who took the online *Distance Learning Guide* (DLG) course in the Open Distance Education Center of Beijing Normal University during two semesters: September 2009 and March 2010. The 54-item questionnaire was sent online to all the 5850 students taking the DLG course during the two semesters. A total of 4,032 questionnaires were received back (68.9% response rate), of which 2,738 questionnaires were found as valid (valid rate of 67.9%). The entrance level of the 2,738 sample range over two cohorts including either from senior high school (grade 12; $n = 1,165$) or from junior college (grade 14; $n = 1,573$). The characteristics of the sample are given in Table 6.

In the final sample, there were more males than females, more students came from junior colleges (after graduating grade 14) and students with age below 30 were more than other age groups. The final 2,738 questionnaires were put to analysis the results of which are given in the next section.

Table 6: The survey sample

Variables	Categories	Sample size
Gender	Male	1,630
	Female	1,108
Entrance level	From junior college	1,573
	From senior high school	1,165
Age	<30	1,637
	30–39	847
	>39	254
Total		2,738

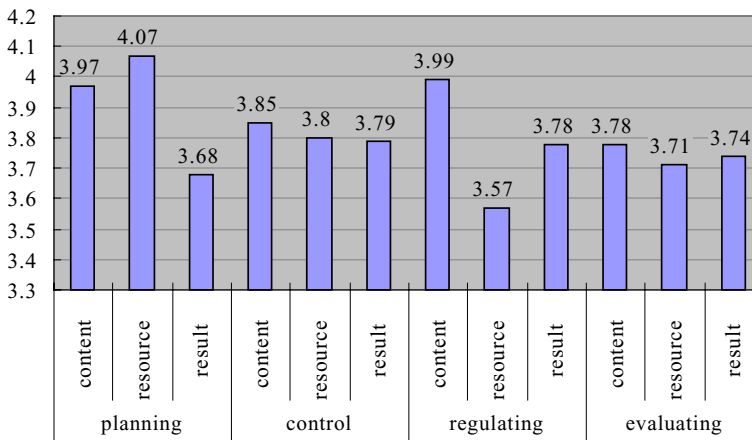


Figure 1: Scores on the second-level dimensions

Results

The general characteristics of self-regulated learning ability

The average scores of the four first-level dimensions were calculated. The average scores of SRL ability of all the samples were above the mid-point on the 5-point scale. The highest score was for planning capability (score 3.93), followed by control capability (score 3.81), regulating capability (score 3.75) and evaluation capability (score 3.74).

The average scores on scales relating to the second-level dimensions were obtained (see Figure 1). Scores on the content dimensions were relatively high across all the first-level dimensions, indicating that the Chinese distance learners had good planning, controlling, regulating and evaluating capabilities in relation to learning content. The resources regulating ability was the lowest, which indicated the learners could not appropriately select and use the resources.

Figure 1 showed that the Chinese distance learners had basic capabilities to plan to use the resources but were not so good at planning the result though they could select strategies appropriately according to learning objective and content. The learners were susceptible to interference from learning environment factors and were unable to take measures to adjust. They were not used to rethinking or evaluating the rationality of their planning. Furthermore, the result suggested that the learners could not apply their self-regulated ability skillfully and especially lacked strategies of meta-cognitive monitoring.

Gender differences in self-regulated learning ability

The remaining analyses are in themselves the first exploratory step towards a full multivariate analysis of these data. First, *t*-test was used to study the gender differences of self-regulated ability. A significant gender difference was observed across the data as a whole ($t = 2.371$, $p < 0.05$), suggesting that male distance learners were significantly better in self-regulated learning ability than female learners (Table 7). The results of *t*-tests of the four first-level dimensions indicated that there were significant gender differences on the control dimension ($t = 2.487$, $p < 0.05$) and the evaluation dimension ($t = 3.105$, $p < 0.01$) (Table 8), suggesting males to have higher such abilities than female learners.

In view of the significant gender differences on the control and evaluation dimensions, *t*-tests were then conducted on the second-level dimensions on each of them. The second-level gender difference for the control dimension is shown in Table 9 and for the evaluation dimension in Table 10. The male learners scored significantly higher than the female learners on the control content dimension ($t = 2.441$, $p < 0.05$) and control resources dimension ($t = 3.002$, $p < 0.01$), and on all the three second-level dimensions of the evaluation dimension ($t = 3.040$, $p < 0.01$; $t = 2.937$, $p < 0.01$; $t = 2.160$, $p < 0.05$).

Table 7: *The general gender differences*

Gender	n	Average score	SE	t	p
Male	1,630	3.81	0.394	2.371	0.018*
Female	1,108	3.77	0.396		

* $p < 0.05$.Table 8: *Gender differences in first-level dimensions*

First-level dimensions	Gender	n	Average score	SE	t	p
Planning	M	1,630	3.93	0.43	1.57	0.116
	F	1,108	3.91	0.43		
Control	M	1,630	3.82	0.43	2.48	0.013*
	F	1,108	3.78	0.44		
Regulating	M	1,630	3.75	0.38	1.03	0.302
	F	1,108	3.74	0.38		
Evaluation	M	1,630	3.76	0.46	3.10	0.002**
	F	1,108	3.71	0.46		

* $p < 0.05$ ** $p < 0.01$.Table 9: *Gender difference in control dimension*

Levels	Gender	n	Average score	SE	t	p
Control content	M	1,630	3.87	0.57	2.44	0.015*
	F	1,108	3.81	0.56		
Control resource	M	1,630	3.82	0.51	3.00	0.003**
	F	1,108	3.76	0.51		
Control result	M	1,630	3.79	0.55	0.83	0.403
	F	1,108	3.77	0.56		

* $p < 0.05$ ** $p < 0.01$.

Table 10: Gender difference in evaluation dimension

Levels	Gender	n	Average score	SE	t	p
Evaluation content	M	1,630	3.80	0.51454	3.040	0.002**
	F	1,108	3.74	0.52087		
Evaluation resource	M	1,630	3.73	0.51711	2.937	0.003**
	F	1,108	3.67	0.51627		
Evaluation result	M	1,630	3.75	0.55684	2.160	0.031*
	F	1,108	3.71	0.54357		

* $p < 0.05$ ** $p < 0.01$.

Table 11: The general entrance level differences

Entrance level	n	Average score	SE	t	p
From junior college	1,165	3.82	0.39	2.74	0.006**
From senior high school	1,573	3.78	0.39		

** $p < 0.01$.

Table 12: Entrance levels differences in first-level dimensions

Levels	Entrance level	n	Average score	SE	t	p
Planning	From junior college	1,165	3.96	0.43	4.13	0.000***
	From senior high school	1,573	3.89	0.43		
Control	From junior college	1,165	3.81	0.44	1.00	0.316
	From senior high school	1,573	3.79	0.43		
Regulating	From junior college	1,165	3.77	0.38	2.60	0.009**
	From senior high school	1,573	3.73	0.38		
Evaluation	From junior college	1,165	3.77	0.46	2.55	0.011*
	From senior high school	1,573	3.72	0.46		

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$.

Age differences in self-regulated learning ability

A one-factor analysis of variance was used to study the age differences of self-regulated learning ability. No significant difference was found among the three age groups ($F = 0.06$, $p = 0.941$) in any of the four first-level dimensions.

Entrance level differences in self-regulated learning ability

A t -test indicated that learners from junior college scored significantly more in self-regulated learning ability than learners from senior high school ($t = 2.747$, $p < 0.01$) as presented in Table 11. Table 12 indicates that there were significant differences in planning ($t = 4.131$, $p < 0.001$), regulating ($t = 2.605$, $p < 0.01$) and evaluating dimensions ($t = 2.550$, $p < 0.05$). The result showed the learners from junior college had better planning, regulating and evaluating capabilities than the learners from senior high school.

Finally, the significant entrance level differences in each of the three first-level dimensions (planning, regulating and evaluation) were calculated with the help of t -test. Table 13 indicates that learners from junior college was higher than the learners from senior high school on all second-level planning dimensions ($t = 2.989$, $p < 0.01$; $t = 3.456$, $p = 0.001$; $t = 3.399$, $p = 0.001$). Table 14 shows that the entrance level difference in the regulating dimensions was

Table 13: Entrance level differences in planning dimension

<i>Dependent variable</i>	<i>Entrance level</i>	<i>n</i>	<i>Average score</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Planning content	From junior college	1,165	4.00	0.52	2.98	0.003**
	From senior high school	1,573	3.94	0.52		
Planning resource	From junior college	1,165	4.11	0.52	3.45	0.001**
	From senior high school	1,573	4.04	0.52		
Planning result	From junior college	1,165	3.72	0.59	3.39	0.001**
	From senior high school	1,573	3.64	0.61		

** $p < 0.01$.

Table 14: Entrance level differences in regulating dimension

<i>Dependent variable</i>	<i>Entrance level</i>	<i>n</i>	<i>Average score</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Regulating content	From junior college	1,165	4.03	0.50	3.43	0.001**
	From senior high school	1,573	3.96	0.52		
Regulating resource	From junior college	1,165	3.58	0.39	1.42	0.153
	From senior high school	1,573	3.56	0.40		
Regulating result	From junior college	1,165	3.79	0.51	1.70	0.089
	From senior high school	1,573	3.76	0.52		

** $p < 0.01$.

Table 15: Entrance level differences in evaluation dimension

<i>Dependent variable</i>	<i>Entrance level</i>	<i>n</i>	<i>Average score</i>	<i>SE</i>	<i>t</i>	<i>p</i>
Evaluation content	From junior college	1,165	3.80	0.51	2.059	0.040*
	From senior high school	1,573	3.76	0.52		
Evaluation resource	From junior college	1,165	3.74	0.51	3.214	0.001**
	From senior high school	1,573	3.68	0.51		
Evaluation result	From junior college	1,165	3.75	0.55	1.266	0.205
	From senior high school	1,573	3.72	0.55		

* $p < 0.05$, ** $p < 0.01$.

significant only for the content dimension that suggested that learners from junior college had better capabilities to regulate learning content ($t = 3.432$, $p = 0.001$), though there were no differences in regulating resource and regulating result.

Table 15 indicated that there were significant differences in the content and resource aspects of the evaluation dimension. The learners from junior college performed better than the learners from senior high school in evaluating learning content and learning resources ($t = 2.059$, $p < 0.01$; $t = 3.214$, $p = 0.001$).

Discussion

This study focused on the investigation of the self-regulated learning abilities of Chinese distance learners by using a standardized scale—SRAS. The SRAS was found to be a reliable instrument for studying the self-regulated learning abilities of distance learners. Moreover, the results provide empirical evidence towards further cultivation of self-regulated learning abilities among distance learners. The results suggested that: (1) the self-regulated learning ability of Chinese distance learners was at the medium level, but there was considerable variation in the

second-level dimensions; (3) there were significant gender differences that represented that males had higher self-regulated learning ability than females, especially at control and evaluation first-level dimensions, and content and resources at the second-level dimensions; and (3) a prominent difference happened at the entrance level, representing that the distance learners from junior college performed higher self-regulated learning than the learners from senior high schools, especially at planning, regulating and evaluation levels.

The results are consistent with the previous research studies (Dayong & Wenjing, 2007; In-Sook, 2002; Xiaochun, 2004) and are closely related to the culture of learning in China. China is a patriarchal society. The patriarchy culture has different demands and emphasizes the different social division of labor for men and women. There are two distinctive features of female cultural education influenced by traditional Chinese culture: family-oriented concept and the tendency to emphasize overly on ethnicity and morality. So in China, women are demanded to be obedient and disciplined. Housework and taking care of children are their key responsibilities. However, for men, the responsibility is towards the family income, which demands men to go out to work (Bohong, 2009; Chunling, 2009).

The Chinese traditional idea on gender brings about gender stereotype. Men are independent and women are more dependent on men, regardless of their incomes. Compared with women, men have more opportunities to control their lives and may develop better self-regulated learning abilities.

Early studies have found that the total level of self-regulated learning ability of senior high school students was at a medium level and the evaluation ability was especially low (Chunmei, 2008; Tingting & Juan, 2007), which is consistent with the findings of the present research. The analysis of main reasons shows that the learners from senior high schools have generally failed the college/university entrance exam. So they lack confidence in learning and have the characteristics of teacher/parent-dependence and poor self-control (Qian, 2010).

Compared with senior high school, junior colleges in China put more emphasis on the vocational skill development and social practice, and also provide more opportunities for junior college students to schedule their learning (Qian, 2010). So junior college students are entitled to greater freedom of what to learn, in which way to learn and what to achieve in learning. In a way, they have more experiences of self-management.

When distance education was initiated in China in 1979 with provision for part-time learners to study the conventional text books supported by television broadcasts and face-to-face group tuition available at community branch schools/classes, this was in tune with the age-old classroom-based and teacher-dependent strategy of group tuition without much independent self-learning (Wei, 2010). The post-1990 reform brought offer of both part-time study for employed adult learners and full-time study for high school graduates, as also the scheme of 'registered free viewers and listeners' shifted more towards independent study with less intervention through television and group tuition. However, this strategy could not reform the age old culture of learning in China so as to move to independent and self-regulated learning. Even if some Radio and Television Universities (RTVUs) have become dual-mode (teaching both part-time students at a distance and full-time students on campus for vocational courses), the principal source of learning for part-time learners is self-learning packages. Recently with a few RTVUs going for open university status (including CRTVU renamed as Open University of China), the pursuance of open access, open learning and self-learning will be vigorous in future; and therefore, self-regulated learning will be a prominent issue too.

The results of the current study have significant implications for instructional design and research in Chinese distance education institutions. First, the results have implications for the gender differences. The females seemed to experience more difficulties in distance self-regulated

learning. Women in China bear more housework which resulted in insufficient learning time for them. Moreover, most female learners were first timers in distance learning and lacked confidence and were anxious. Therefore, the tutors should pay more attention to difficulties or problems of female learners and provide more individualized learning support especially for meta-cognitive ability, self-pacing and self-study, planning of resources, and organizing future career. Second, in terms of entrance level, instructional designers and tutors can consider individualized teaching according to the distance learners of different entrance level to improve knowledge and ability, help them develop self-confidence and independent study habits. At present, the distance teaching institutions including the National Centre for Open and Distance Education do not have structured provisions towards helping learners learn independently and take full responsibility of their own learning. Third, though the self-regulated ability of Chinese distance learners is at the medium level, the distance learners scored low on the regulating and evaluation capabilities, especially regulating resources. So fostering self-regulated learning ability should be a key element at all levels of distance education courses.

Recent research studies proved that the skills of learners, especially the low academic achievers, can be improved by using self-regulatory instructional methods in web learning environments (Shen *et al.*, 2008; Young, 1996). As for the effects of SRL on computer-based instruction, Bielaczyc, Pirolli and Brown (1995) incorporated self-regulation strategies in computing programming and found that the experimental group with incorporation of self-regulation strategies performed better than the control group without the benefit of instruction in these SRL strategies. Shen *et al.* (2008) also found that the teaching method based on SRL enhanced students' skill of using application software in cyber learning environments. Moreover, based on their results, they suggested that teachers should help students to regulate their learning by applying SRL instructional methods in a web-based learning environment (Shen *et al.*, 2008).

The above research studies implied that learners profit from the incorporation of SRL instructional methods that engage them in planning, monitoring and evaluating their learning. According to Zimmerman, Bonner and Kovach (1996), the SRL instructional content should be composed of four processes: (1) self-evaluation and monitoring; (2) goal-setting and strategy planning; (3) strategy implementation and monitoring; and (4) monitoring of the outcome of strategy. This is also equally applicable to all types of distance learning and self-learning situations. Though the present study used a fairly large sample group, this was limited to one institution (however nationally and regionally represented it may be). Therefore, further research is needed on: (1) how and why distance and online learners use specific SRL abilities and how they influence their learning outcomes/achievements; and (2) other radio and television/open universities in China need to strengthen the area of self-regulated learning so that distance teaching institutions can be better advised on how to strategies towards overcoming the age old teacher-dependent instructional methods and encourage and mainstream more self (regulated) learning and independent study (occasional student–teacher and student–student interactions notwithstanding).

References

- Andrade, M. S. & Bunker, E. L. (2009). A model for self-regulated distance language learning. *Distance Education*, 30, 1, 47–61.
- Bandura, A. (1986). *Social foundations of thought and action*. Englewood Cliffs, NJ: Prentice-Hall.
- Bielaczyc, K., Pirolli, P. & Brown, A. (1995). Training in self-explanation and self-regulation strategies: investigating the effects of knowledge acquisition activities on problem solving. *Cognition and Instruction*, 13, 2, 221–252.
- Boekaerts, M., Pintrich, P. R. & Zeidner, M. (Eds) (2000). *Self-regulation: theory, research, and applications*. Orlando, FL: Academic Press.
- Bohong, L. (2009). The concept and features of social gender mainstream. *Women's Academy at Shandong*, 88, 6, 1–8.

- Brooks, D. W., Nolan, D. E. & Gallagher, S. M. (2001). *Web-teaching: a guide to designing interactive teaching for the world wide web* (2nd ed.). New York: Kluwer Academic/Plenum Publishers.
- Chen, C. (2002). Self-regulated learning strategies and achievement in an introduction to information systems course. *Information Technology, Learning, and Performance Journal*, 20, 1, 11–25.
- Chunling, L. (2009). Present situation and development trend of occupational gender segregation in China. *Jiangsu Social Sciences*, 3, 9–16.
- Chunmei, H. (2008). A research of self-regulated learning ability of high middle school students. *Journal of Chongqing University of Arts and Sciences (Social Sciences Edition)*, 27, 4, 108–113.
- Dayong, W. (2007). Research on distance learner's ability of self-directed learning. *Distance Education in China*, 5, 31–36.
- Dayong, W. & Wenjing, M. (2007). The study of self-regulated learning ability of distance learners. *The Journal of Open Education Research*, 3, 40–46.
- Dembo, M. H. & Eaton, M. J. (2000). Self-regulation of academic learning in middle-level schools. *The Elementary School Journal*, 100, 5, 473–490.
- Greene, J. & Azevedo, R. (2007). Adolescents' use of self-regulatory processes and their relation to qualitative mental model shifts while using hypermedia. *Journal of Educational Computing Research*, 36, 2, 125–148.
- Guowei, P. (2003). *Self-regulated learning: principle and strategies of teaching and learning*. Shanghai: East China Normal University Press. pp. 2–7.
- Hartley, K. & Bendixen, L. D. (2001). Educational research in the internet age: examining the role of individual characteristics. *Educational Researcher*, 30, 9, 22–26.
- Holec, H. (1981). *Autonomy and foreign language learning*. Oxford: Pergamon.
- Honeyman, M. & Miller, G. (1993). Agriculture distance education: a valid alternative for higher education. Proceedings of the 20th Annual National Agricultural Education Research Meeting, 67–73.
- In-Sook, L. (2002). Gender differences in self-regulated on-line learning strategies within Korea's university context. *Educational Technology Research and Development*, 50, 1, 101–111.
- Paris, S. G. & Paris, A. H. (2001). Classroom applications of research on self-regulated learning. *Educational Psychologist*, 36, 2, 89–101.
- Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds), *Handbook of self-regulation* (pp. 451–502). San Diego, CA: Academic Press.
- Pintrich, P. R., Smith, D. A., Garcia, T. & McKeachie, W. J. (1991). *A manual for the use of the Motivated Strategies for Learning Questionnaire*. Ann Arbor, MI: The Regents of the University of Michigan.
- Qian, Z. (2010). A study on the developmental characteristics of career maturity of five-year Junior College students. *Health Medicine Research and Practice*, 7, 3, 26–29.
- Risemberg, R. & Zimmerman, B. J. (1992). Self-regulated learning in gifted students. *Roeper Review*, 15, 2, 98–101.
- Shen, P.-D., Lee, T.-H. & Tsai, C.-W. (2008). Enhancing skill of application software via Web-enabled problem-based learning and self-regulated learning: an exploratory study. *International Journal of Distance Education Technologies*, 6, 3, 69–84.
- Simons, P. R. J. & Vermunt, J. D. H. M. (1986). Self-regulation in knowledge acquisition: a selection of Dutch research. In G. Beukhof & P. R. J. Simons (Eds), *German and Dutch research on learning and institution: general topics and self-regulation in knowledge acquisition* (pp. 101–135). The Hague: S.V.O.
- Tingting, W. & Juan, Z. (2007). A survey of high school students on self-regulated learning. *Journal of Ningbo University (Educational Science)*, 29, 6, 15–19.
- Vanijdee, A. (2003). The distance English learners and learner autonomy. *Open Learning*, 18, 1, 75–84.
- Wei, R. (2010). China's radio and TV universities: reflections on theory and practice of open and distance learning. *Open Learning*, 25, 1, 45–56.
- White, C. (2003). *Language learning in distance education*. Cambridge, MA: Cambridge University Press.
- Winnips, K. (2000). *Scaffolding-by-design: a model for WWW-based learner support*. Enschede: University of Twente Press.
- Xiaochun, X. (2004). The self-regulated learning analysis of distance learners. In: *Proc. Conf. Open and Distance Learning in Cyber Age*, Jinan, Shandong Radio and Television University, 2004, pp. 66–71.
- Ying, G. (2005). The investigation and analysis of self-regulated learning ability for distance learners. *Modern Distance Education*, 5, 30–33.
- Young, J. D. (1996). The effect of self-regulated learning strategies on performance in learner controlled computer-based instruction. *Educational Technology Research and Development*, 44, 2, 17–27.
- Zimmerman, B. J. (2000). Attaining self-regulation: a social cognitive perspective. In M. Boekaerts, P. R. Pintrich & M. Zeidner (Eds), *Handbook of self-regulation* (pp. 13–39). New York: Academic Press.

- Zimmerman, B. J. (1998). Developing self-fulfilling cycles of academic regulation: an analysis of exemplary instructional models. In D. H. Schunk & B. J. Zimmerman (Eds), *Self-regulated learning: from teaching to self-reflective practice* (pp. 1–19). New York: Guilford.
- Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: an overview. *Educational Psychologist*, 25, 3–17.
- Zimmerman, B. J., Bonner, S. & Kovach, R. (1996). *Developing self-regulated learners: beyond achievement to self-efficacy*. Washington, DC: American Psychological Association.
- Zimmerman, B. J. & Martinez-Pons, M. (1986). Development of a structured interview for assessing student use of self-regulated learning strategies. *American Educational Research Journal.*, 23, 4, 614–628.
- Zimmerman, B. J. & Paulsen, A. S. (1995). Self-monitoring during collegiate studying: an invaluable tool for academic self-regulation. In P. Pintrich (Ed.), *New directions in college teaching and learning: understanding self-regulated learning* (No. 63, Fall) (pp. 13–27). San Francisco: Jossey-Bass.
- Zimmerman, B. J. & Schunk, D. H. (2001). *Self-regulated learning and academic achievement: theoretical perspectives*. Mahwah, NJ: Lawrence Erlbaum.