Development and Research on Courses Arrangement Management System of Innovation and Entrepreneurship Education in Colleges and Universities based on Genetic Algorithm

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Abstract

Due to the continuous expansion in enrollment of colleges and universities, quantity of college students is promoted year by year, with college graduate reaching 7,650,000 in 2016, while, the limited employment position in society cannot be able to fulfill the employment demand, resulting in increasingly sharp conflict and serious social problem. In order to solve employment problem of college graduate, China has brought forward policy of actively encouraging college students to carry out innovation and entrepreneurship, and has enhanced policies for innovation and entrepreneurship education in colleges and universities, to which, colleges and universities and civil groups nationwide actively response, carrying out innovation and entrepreneurship education through information technology, and establishing civil organizations such as assistance training management organization, etc. However, there are usually problems in practical teaching, information platform paying more attention to the presentation of innovation and entrepreneurship related information, having no relationship with education, on the other hand, the imperfect course management arouses conflicts among classes, time, course, teacher, classroom, etc. In order to solve the problems mentioned above, course arrangement management system of innovation and entrepreneurship in colleges and universities is established in this research, based on Genetic Algorithm, to provide references for improving education quality of innovation and entrepreneurship in colleges and universities.

Keywords: Genetic Algorithm, Innovation and Entrepreneurship Education, Course Management.

1. RESEARCH OVERVIEW

1.1 Research background

Unemployment and employment are difficult problems inevitably confronted in economic development of countries. Early in 2007, the unemployment rate of global youth was 11.5%, being improved to be 12.4% in 2012. In line with prediction, the unemployment rate in 2018 shall be 12.8%, showing that there will be a great number of unemployed youth all over the world. Employment promotion is the important approach to improve continuous development of social economy in China and establish harmonious & stable society. Due to influence of multiple subjective and objective factors, employment difficulty is very common in most college students. Large quantity of students enters into society, but fails to find ideal job in line with specialty, arousing this kind of sharp social problem. While, the most effective method to solve this problem is to encourage college students to carry out self-employment, which is able to, on the one hand, effectively optimize economic structure of China in the way of market macroeconomic regulation & control and promote development of social economy, on the other hand, provide more employment positions for college students, bringing promoting effect to alleviate employment difficulties. Therefore, in education of colleges and universities, innovation and entrepreneurship education is gradually paid attention to, and under the background of education informatization, how to promote education quality of innovation and entrepreneurship in colleges and universities, and cultivate the innovation and entrepreneurship capability through information technology, is one of the key problems needed to be resolved immediately.

1.2 Literature review
Course arrangement system of innovation and entrepreneurship education in colleges and universities shall consider cultivating students to learn entrepreneurship knowledge as the subject, pay attention to promoting practice standard of students through simulated practice and practical operation, realize key problems of students during innovation and entrepreneurship through tracking and assistance, and be targeted to solve them. Therefore, innovation and entrepreneurship education system of colleges and universities shall set about aspects such as web portal display, classroom education management, after-class teaching tracking, teaching materials arrangement, innovation and entrepreneurship case sharing, course optimization design, etc., and establish education platform of innovation and entrepreneurship with stronger practicability, richness and simplicity & convenience (Liu et al., 2014). Course arrangement is reasonable arrangement on courses when there’s conflict among class, time, course, teacher, classroom, etc. Due to large amount of student quantity, majors, teachers, categories of courses in colleges and universities, data involved in course arrangement is huge. Therefore, only the course system by using computer is able to effectively fulfill the course arrangement requirements of colleges and universities. Nowadays, there are still some problems in course arrangement system of innovation and entrepreneurship in colleges and universities, for example, complicated algorithm, enormous calculated amount, having higher requirement on the operational performance of computer. Therefore, genetic algorithm is able to be applied to carry out optimal settings on course arrangement system of innovation and entrepreneurship education in colleges and universities, effectively solve the defect of traditional course arrangement, and promote course arrangement level of innovation and entrepreneurship education in colleges and universities (Liu and Deng, 2014). It has been the important part in Chinese government work to promote employment of college graduates, while students’ consciousness on innovation and entrepreneurship is motivated, through innovation and entrepreneurship education, and innovation and entrepreneurship capability is cultivated, on the one hand, to provide a large number of employment positions for college graduates, and promote the stable development of social economy, on the other hand, effectively alleviate social contradictions and make important contribution to the establishment of harmonious socialist society. It demands the colleges and universities to pay attention to carrying out innovation and entrepreneurship education, and fulfills the core purpose of promoting education level of innovation and entrepreneurship in colleges and universities, through actively establishing network education platform (Shi et al., 2015).

2 INTRODUCTION TO COURSE ARRANGEMENT PROBLEMS IN INNOVATION AND ENTREPRENEURSHIP EDUCATION OF COLLEGES AND UNIVERSITIES

2.1 Course arrangement objectives of innovation and entrepreneurship education in colleges and universities

Being the key and difficult point in teaching management and educational administration system of colleges and universities, course arrangement refers to distribute study plan of teachers and students in space and time, being limited by some certain conditions, to guarantee each school, major, subject, teacher and student are able to get more clear curriculum, formulating the integrated framework of colleges and universities. In innovation and entrepreneurship education, there are major differences among education resources, such as library, multimedia classroom, quantity and capacity of activity room, etc. (Li, 2015). Meanwhile, there are multiple categories of innovation and entrepreneurship courses, including basic knowledge training, simulated practice of entrepreneurship, entrepreneurship practice training, etc. Besides, teaching demand is different due to different teachers, for example, more teachers pay attention to how to explain knowledge, the others pay more attention to providing activity space for students. Therefore, it’s the key factor, influencing the education level of innovation and entrepreneurship, to be able to arrange high-quality curriculum.

Course arrangement in innovation and entrepreneurship education of colleges and universities are substantially to seek for optimal solutions, needing to avoid multi-dimensional conflicts among teacher, classroom, time, course, etc., and work out optimal method through reasonable arrangement. Its core objective is, under restriction of multi-dimensional conflicts, to carry out reasonable allocation on limited resources and fulfill the demand of innovation and entrepreneurship education in colleges and universities to the utmost extent (Xue et al., 2016).

2.2 Constraint condition in course arrangement for innovation and entrepreneurship in colleges and universities

In order to guarantee no conflict among multi-dimensional factors in course arrangement and fulfill demand of teachers and students to the utmost extent, the following principles shall be abided by:
Firstly, must arrange each course completely;
Secondly, students of only one class shall have lesson in one classroom at the same time;
Thirdly, one class shall only learn one course at the same time;
Fourthly, one teacher shall only instruct one class at the same time; Fifthly, type of class, content and function shall be in line with the teaching content designed in advance; Sixthly, students attending class shall be less than the maximum of the allocated classroom (Li, 2015). The content mentioned above is the most basic requirement in course arrangement of innovation and entrepreneurship education, any dissatisfaction shall bring serious influence on education quality of innovation and entrepreneurship. While, if utilization ratio of teaching resources shall be further upgraded to achieve the aim of promoting the education level of innovation and entrepreneurship, more humanized course arrangement system shall be needed to be established, by abiding by the following principles: Firstly, try to guarantee the balance of class hour, and avoid too intensive arrangement in a period of time; Secondly, course arrangement shall combine with practical situation and teaching preference of teachers; Thirdly, the same course shall be separated at least more than one day (Ding, 2016).

2.3 Mathematical model of innovation and entrepreneurship course arrangement system in colleges and universities

For course arrangement of innovation and entrepreneurship in colleges and universities, the 5 most crucial factors are time, course, class, teacher and classroom. Course arrangement is substantially multi-objective optimization problem under multiple constraints, therefore, the mathematical model is:

$$\max \ y = f(x) = (f_1(x), f_2(x), \ldots, f_k(x))$$  \hspace{1cm} (1)

Among which, \( n \) refers to decision variable parameter, \( k \) refers to quantity of objective function, \( m \) refers to quantity of constraint condition, formula of which is shown as follows:

$$e(x) = (e_1(x), e_2(x), \ldots, e_m(x)) \leq 0$$  \hspace{1cm} (2)

In the formula mentioned above, \( x = (x_1, x_2, \ldots, x_n) \in X, \ y = (y_1, y_2, \ldots, y_m) \in Y, \ X \) refers to feasible solution in course arrangement of innovation and entrepreneurship in colleges and universities, and influence factors included in \( x \) directly relate to the level of course arrangement. \( e(x) \) refers to constraint condition, the value range of decision vector, \( y \) refers to vector quantity of optimization objective, and \( Y \) refers to target space (Wang, 2016).

Assuming that all conflicts in course arrangement of innovation and entrepreneurship in colleges and universities is zero, the formula is shown as follows:

$$f = \sum_{c \in C} v(c) = 0$$  \hspace{1cm} (3)

Among which, \( c_j \) refers to constraint set of the category of \( j \), and when \( v(c)=0 \), it meets the constraint condition \( c \), while, when \( v(c)=1 \), it does not meet the constraint condition \( c \).

3 Multi-goal analysis on course arrangement of innovation and entrepreneurship in colleges and universities

Time, course, class, teacher and classroom are five crucial factors needed to be considered in course arrangement of colleges and universities, besides, in order to guarantee the superiority of course arrangement for innovation and entrepreneurship, the following constraint conditions shall also be fulfilled (Zhao and Yang, 2016).

3.1 Section goodness

Section goodness means the quantitative index of the course quality, which is able to visually bring forward feedback regarding students’ satisfaction on course arrangement, having important reference value on examining teaching efficiency of innovation and entrepreneurship education. Section goodness can be indicated by tempon goodness \( \rho_t \), with value range of \( 0 \leq \rho_t \leq 1 \). Computational formula on section goodness of course arrangement for innovation and entrepreneurship in colleges and universities is shown as follows:
Among which, \( p \) refers to the total quantity of innovation and entrepreneurship courses in colleges and universities, \( s_i \) refers to the quantity of the \( i \)th course, \( t_{ij} \) refers to attendance in the \( j \)th class of the \( i \)th course, \( \rho_{ijk} \) refers to the goodness of the \( k \)th class in the \( j \)th class of the \( i \)th course. \( \bar{\rho} \) refers to the average degree, the higher of the value of which, meaning the higher level of course arrangement for innovation and entrepreneurship in colleges and universities.

### 3.2 Daily equilibrium of distribution of class hour

Recently, in course arrangement of colleges and universities, it’s very easy to find out that one day is full of class or no class, which may have certain of negative effect on quality of education. In order to avoid this kind of problem, it is able to construct distribution variance of class hours as follows:

\[
\sigma_i = \sqrt{\frac{\sum_{d=1}^{dw} (h_{id} - \bar{h}_i)^2}{d}}
\]  

(5)

The average section number is shown as follows:

\[
\bar{h}_i = \frac{1}{dw} \sum_{d=1}^{dw} h_{id}
\]  

(6)

Among which, \( h_{id} \) refers to course number in class \( i \) on the \( d \)th working day each week, \( dw \) refers to the total days of class for innovation and entrepreneurship in colleges and universities. The above mentioned formula shall be carried out optimal settings to improve calculating level, and the result is shown as follows:

\[
\bar{\varepsilon} = \frac{1}{n} \sum_{i=1}^{n} \frac{l_i}{\sigma_i}
\]  

(7)

Among which, the higher the value of \( \bar{\varepsilon} \), the smaller the distribution variance, meaning course arrangement each day is comparatively balanced to effectively promote the education quality of innovation and entrepreneurship in colleges and universities.

### 3.3 Teachers’ satisfaction on expected time

Teachers with different basic information have different preference on time. It is assumed that teachers’ satisfaction on lessons is divided into three levels, separately satisfied, common and unsatisfied, which shall be demonstrated by \( \omega_1 = 1, \omega_2 = 0.5, \omega_3 = 0 \). If the three levels are corresponding to three different school hours, \( h_1, h_2, h_3 \) teachers’ satisfaction on course arrangement is able to demonstrated in the following formula:

\[
r_i = \frac{\omega_1 h_{1i} + \omega_2 h_{2i} + \omega_3 h_{3i}}{h_{1i} + h_{2i} + h_{3i}}
\]  

(8)

Computational formula of all teachers’ satisfaction on course arrangement is shown as follows:
3.4 Teachers’ satisfaction on class hour distribution

With different teaching habits, some teachers are fond of continuous lessons to formulate enough time period, while, another part are fond of dispatched lessons to reduce work stress. The first thing to be worked on when seeking for judgment on teachers’ satisfaction on different class hour distribution is to calculate the intensity of course schedule for innovation and entrepreneurship education of each teacher, and the formula is shown as follows:

$$\bar{r}_i = \frac{1}{p} \sum_{i=1}^{p} r_i, (1 \leq i \leq p)$$  \hspace{1cm} (9)

Distance between different lessons is shown as follows:

$$d_{ij} = \pi_{d1} |r_i - r_j| + \pi_{p1} |p_i - p_j| + \pi_s \min|s_i - s_j|$$  \hspace{1cm} (11)

Results concluded through the above mentioned formula shall be brought into $d = \frac{\sum_{i=1}^{n} d_{ij}}{n(n-1)/2}$ to work out the course arrangement intensity of innovation and entrepreneurship education in colleges and universities. Considering the fondness on course arrangement intensity of each teacher, preferred modulus $v$ is selected, when $v=0$, it seems the teacher would rather give lessons separately, and when $v=1$, it seems teachers usually prefer to break apart the courses, and the computational formula is shown as follows:

$$\overline{d} = \sum_{i=1}^{m} (-1)^{v_i} \bar{d}$$  \hspace{1cm} (12)

4 EMPIRICAL STUDY ON COURSE ARRANGEMENT MANAGEMENT SYSTEM OF INNOVATION AND ENTREPRENEURSHIP IN COLLEGES AND UNIVERSITIES BASED ON GENETIC ALGORITHM

4.1 Selection of research object

![Figure 1. Statistics of class hour and class week](image-url)
Students of Class 2015 in one University are selected to be research object, on which four terms of training were carried out, 2 months per term, and the same two courses in different terms are considered as different courses. There are 26 main training courses, with 448 class hours. 8 teachers and 25 classes took part in this study, totally occupying 7 innovation and entrepreneurship education classrooms. Innovation and entrepreneurship courses concentrate from Monday to Friday, with two class hours separately in the morning and afternoon, and most courses are intensively arranged in the first 10 weeks, with average 42 class hours per week (Li and Ding, 2016).

This year, each teacher averagely gives 56 lessons, having reached the average workload distributed to them. Class hour distribution map is shown in figure 2:

![Figure 2. teacher hours map](image1)

Class daily distribution map is shown in Figure 3:

![Figure 3. class daily distribution map](image2)

Two months were considered as one term, in which, there are 112 class hours, and each class shall averagely have 19 lessons per week. After analysis on the results mentioned above, the change rule of fitness value can be obtained, while in parts, the change of fitness value is comparatively disordered with no definite rule. Generally speaking, the vibration scope is diminishing, and its service will be increasingly smaller if continues, until the vibration scope is almost ignored (Liu and Zhan, 2016). Therefore, as long as the period of operation being infinity extended, some certain of formation shall be brought forward to the terminal condition, being in line with its vibration trend. Therefore, it’s effective to carry out course arrangement on innovation and entrepreneurship in colleges and universities through the method mentioned above (Ma and Bai, 2016).

Under current social background, graduates from colleges and universities are more and more, which has far surpassed the employment positions provided by the society, making college student employment being unpromising. The most effective method to solve this kind of problem is to encourage college students to carry out self-employment, through which, on the one hand, promote transformation development of economic system in China, and provide new motive force of development to the new normal of Chinese economy, on the other
This research mainly emphasizes on the deficiency of course arrangement system establishment in innovation and entrepreneurship education of colleges and universities, and brings forward the construction idea on course arrangement management system through genetic algorithm, which is demonstrated to be effective through practice. However, there are still some defects in this research, mainly in two aspects (Zheng et al., 2012). On the one hand, only portal display platform of system, information issuing platform, classroom teaching affair administration platform, etc., are exhibited, other subsystems are to be analyzed and fulfilled, making it be difficult to more thoroughly provide invocation and entrepreneurship education to college students. In addition, although being in good effect with higher efficiency, this kind of course arrangement method is only applicable to the condition with less constraint, and if there are too many constraints, manual control shall be carried out to meet practical condition. Therefore, this kind of algorithm still has some room for improvement (Gong, 2011).

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