

Academic advising based on undergraduate students' development evaluation through Grey Fuzzy Comprehensive Assessment Method

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Abstract: This paper, considering the complexity of the importance that academic advisement has on the individual development of students' academic career and individual differences, aims to build an indicator system to evaluate the academic activities and mind-body development of college students in different phases during their college years, using the Grey Fuzzy Comprehensive Assessment Method, whilst applying the Analytical Hierarchical Process (AHP) and Entropy Evaluation Method to define the weight of the index, and the Grey correlation coefficient between cases to establish the evaluation matrix in order to achieve accuracy in the evaluation, and finally, to come up with measures and suggestions for improvement.

Keywords: academic advisement; academic activities and mind-body development; AHP; Grey Fuzzy Comprehensive Assessment Method

This article is the result of “Construction of student-centered academic advising system under the full credit system”, which is the key research project of teaching reform on higher education in ShaanXi Province in 2017. (17BG004).

1. Introduction

Higher education has the responsibility of bringing up high-level specialized talents, developing science, technology and culture, promoting modernization. However, its core task is to improve the quality of the talents that it brings up. As higher education is becoming more and more popularized, how to improve such quality is an important issue for all universities. The most important thing is to treat students as the principal part of education, insisting on the "students-centered" approach^[1], which means boosting students' overall and individual developments under this concept and to reform the way of educational management^[2], in order to make the change from being "teaching-centered" to being "learning-centered", from the imparting mode to the studying mode, and finally to improve the quality of learning and students' overall gains in knowledge, abilities and qualities^{[3][4][5]}. With the continuous deepening of the reformation of university teaching management system, it has gradually transformed from the scholastic year system to the complete credit system. It's necessary to build a new and diversified academic advising system based on the individuality of talents training^[6]. Universities must truly realize the changes that the full credit system brings to students' development, in order to reinforce freshman academic advising, open up related courses for students of different school years to adapt to specialized activities, and take measures to improve learning quality all through their university career and build a scientific and effective academic advising system.

The establishment of university academic advising system is a concrete realization of the "student-centered" concept in talent-training. It's advising students in terms of studying methods, learning attitudes, career planning, job direction, etc., in order to maximize educational benefits^[7]. The aim of academic advising is to start with students' academic development needs, according to their interests, abilities, level of education and background, and explore their biggest potential, direct and help them find the most appropriate developing direction^[8]. University academic advising should be focused on students' studies and development^[9]. Studies include students' learning motivations and initiatives and so on, whereas development includes aspects such as their ability to adapt to new environments, to build their own characters, etc.; in the meantime, exploring self-definition of university students is also an important step. With this goal, we investigate how to put into practice the concrete plan of effective university academic advising, of which the base is advising, the guarantee is service, and the development is the deepening of advising and service, which is the higher phase of academic advising^[10]. With the diversification and globalization of college students, universities are obliged to offer professional academic advising to meet the needs of different students^[11]. Therefore, it's not hard to notice study and analyze that students' studies and mind-body development has vital importance on how to carry out higher education academic advising.

The evaluation methods commonly used are Analytical Hierarchical Process(AHP), Analytical Network Process(ANP), Fuzzy Analytical Hierarchical Process(F-AHP) and Grey Fixed Weight Clustering, etc. Once there are many development plans to choose from, there's a lot of calculation and this causes great difficulties when applying the methods. Meanwhile, AHP is a method restricted to experts, which relies more on the personal experience and subjective judgment of the experts and scholars. Due to the subjectivity of this evaluation method, with the uncertainty and ambiguity of the person who exercises the evaluation, the result cannot be totally accurate^[12,13]. As for the Entropy Evaluation Method, the defining of the weight completely

depends on objective data, which means it's unable to reflect the preference of the decision-maker among the different principles. The Grey Hierarchical Comprehensive Evaluation Method, however, parts from the fuzziness and uncertainty of the evaluation grade, and is widely used on system studies about building a precise model with objects that are complex, hierarchical and difficult to quantify. There are many indicators to assess the effect of university internal governance, and most of them are grey, fuzzy and difficult to quantify. As a result, this paper will use Grey Hierarchical Evaluation Method to assess college students' studying activities and mind-body development in order to carry out effective and specified academic advising, aiming to provide an approach of important value of reference to analyze the problem.

2. Indicator system

This paper defines primarily the first level vectors of how university students develop their studying activities and mind-body development during college years, taking as reference a large amount of Chinese and foreign investigations on this topic. Considering the current situation of China and the uniqueness of universities, we have also defined the second level vectors. Moreover, we gave out questionnaires to college professors and management personnel, hosted seminars, consulted experts of this area to finally establish the indicator system for evaluating university students' four-year studying activities and mind-body development. Such system has three aspects: students' studying, individual qualities and future development.

Graphic 1 indicator system for evaluating university students' four-year studying activities and mind-body development

Evaluating object	First level indicators	Second level indicators
university students' four-year studying activities and mind-body development	Studying activities	Studying motivation Studying ability Studying initiative
	Personal qualities	Adapting ability Time management Active adjustment
	Future development	Professional planning Actions Goal realization

3. Evaluating mode

In this section, the evaluation model for determining the weight of index and evaluating the university internal governance is built by integrating Analytical hierarchical process (AHP) method and Grey Fuzzy Evaluation method^[14-17].

A. Determining Weight of Indexes

Determining weight of index is the first step to evaluate performance of university internal governance. The criteria are weighted by using AHP method which is easier and more valid to acquire the reliable criteria weight.

B. Evaluation Model Based on Grey Fuzzy Evaluation

Grey Fuzzy Evaluation method could deal with uncertainty problem with less data, incomplete information and devoid of experience. So it is suitable to make a comprehensive evaluation of university internal governance. The general procedure follows 4 steps:

Step 1: Defining the set of evaluation object and determining the remark grand set.

(1)

Then establishing evaluation matrix by expert judgment indicates the score of index m assessed by expert i .

Step 2: Defining the Grey Whitenization weight Function f_i
Defining grey degree according to the set of remark grade V .

$e=5$, grey number $[5, \infty]$

(2)

$e=4$, grey number

(3)

$e=3$, grey number $[0,3,6]$

(4)

$e=2$, grey number $[0,2,4]$

(5)

$e=1$, grey number $[0,1,2]$

(6)

Step 3: Determining fuzzy relational matrix.
Defines, which indicate assessed value of index.

Then count the overall assessed value of index

(7)

Calculating fuzzy membership degree of on V

(8)

Getting fuzzy membership degree matrix of

Step 4: Fuzzy comprehensive evaluation

Calculating the evaluation results of fuzzy comprehensive evaluation vector M .

(9)

Obtaining the fuzzy comprehensive evaluation value.

(10)

C. Study of cases

First of all, we need to establish a decision-making group, which includes educational management personnel and experts in educational institutes from 10 universities, to assess all the vectors in a comparative way in the system mentioned above. After many rounds of assessments, we get the weighing result as shown in Graphic 2:

Graphic 2 weighing indexes

First level indicators	Weighing result	Second level indicators	Weighing result
Studying activities	0.3202	Studying motivation	0.3203
		Studying ability	0.5571
		Studying initiative	0.1226
Personal qualities	0.5572	Adapting ability	0.1373
		Time management	0.6232
		Active adjustment	0.2395
Future development	0.1226	Professional planning	0.2395
		Actions	0.6232
		Goal realization	0.1373

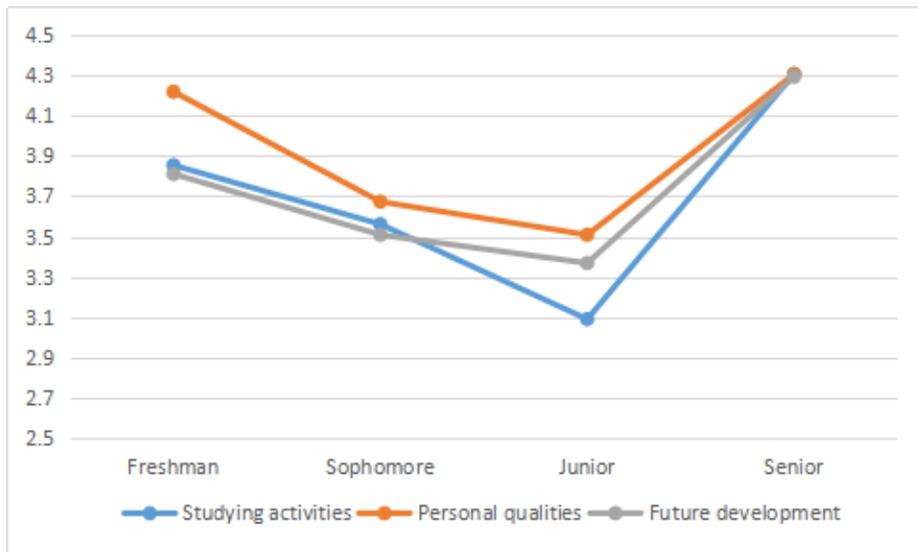
First level indexes:

$$W = \{0.3202, 0.5572, 0.1226\}$$

Second level indexes :

$$W = \{0.3203, 0.5571, 0.1226, 0.1373, 0.6232, 0.2395, 0.2395, 0.6232, 0.1373\}$$

Then, we choose a certain university in Shaanxi as our object and applied the Grey Fuzzy Comprehensive Assessment Method to assess its students of all four grades in terms of their studying activities and mind-body development, which include the three aspects mentioned above. We define the levels of the indexes as: $D = \{5, 4, 3, 2, 1\} = \{\text{very strong, strong, medium, weak, very weak}\}$. After defining the levels, the 10 experts from this university give scores to all four grades. Using the rules 1-9, we define the fuzzy weighing matrix of the four grades, and get the results of the three aspects, as shown in picture 1.



Picture 1 evolution of students' studying activities and mind-body development

From this picture, we can tell that all three aspects show tendency of ascending after descending, which is an active evolution, during which the freshman and senior year show better prospects than the second and third school year. Most people assume that university students' professional cognition gets better as they grow older, also the

hardware facilities, professors' teaching level and educational resources get improved. But the survey shows that it takes three precious years for a good percentage of students to complete the transition from high school to university.

The reason for the situation mentioned above is probably that when freshmen students first high school for university, they still have habits cultivated from test-centered educational mode. They have good basis, high personal qualities and high expectations for the future, so they show positive side in almost every aspect; but as the university life progresses, students start to show intolerance towards a relatively more open way of education. Their originally passive studying method are being overly activated by the more liberal and active way of studying in the university. A lot of students lose their initiative to study, feel lost in terms of academic career planning. By contrast their sense of freedom and self-consciousness gets enlarged, so their studying, personal qualities and future development situations get worse and worse. In the third year students have already finished more than half of their university life, they are in a phase where the studies are more stabilized and reluctant to improve their overall abilities. This is when their negative attitude is maximized, their view about the future is confused, and their overall situation is at the bottom of their college experience. Until they become seniors, most students, under the pressure of job-hunting and postgraduate studies, recover their initiative and start to make up for what they lack, so they make the best effort for future development. During this process, students' studying and mind-body development gets improved gradually, reaching to a level similar to that of freshmen for most students.

4. Academic advising measures

University academic advising work is especially important under the premises of promoting the full credit system and emphasizing the adaptability between university talent training and social needs. It is a systematic educational cause. Faced with the current situation of an ill-defined, one-sided and imperfect system of academic advising, we put forward measures and suggestions to reinforce this system. These measures are based on the investigation results that show the evolution of studying activities and mind-body development of university students from freshmen year to senior year, taking into consideration the common tendency of their development and their actual needs during the development, and involving five aspects which are the transformation academic advising concept, the institution building, team building, strategy making, content perfection.

(1) Transforming academic advising concept, improving the importance of academic advising

The transformation of concepts is of real reformative use to the current implementation of university academic advising. First of all, we should cultivate consciousness in academic advising in management personnel, teachers and students, transitioning from the traditional negligence, superficialness and fragmentation of the matter to active participation.

Firstly, academic advising work should be valued from above. It should be seen as the important component of education. It should be designed from multiple dimensions systematically, institutionally and environmentally, combined with the characteristics of the school and its students, and it should be systematic, comprehensive and all through. Secondly, management personnel should have a clear understanding of the academic advising work. They should realize its urgency and importance and fully appreciate the

leading role it plays in different phases of students' career development and psychological evolution, in order to carry out scientific and in-time academic advising. Thirdly, as students enter university they lower their self-requirement, not to mention paying attention to academic advising. They tend to confuse academic advising with club activities, and think that academic advising lacks real meaning. As a result, they are reluctant to participate in academic advising. There are also students who cannot find answers when they encounter difficulties in their studies because they don't dare or it is inconvenient to communicate with their teachers. As time passes by, some students give up, which directly leads to the worsening of their academic development. So, universities should host lectures or activities after students enter university to change their attitude towards academic advising, and encourage them to actively participate and seek advice, so as to make academic advising a useful and effective tool for students' studies.

(2) Perfecting academic advising system to make it systematic

It's very important to establish a nationwide academic advising system, which should be centered around the idea of full course direction, to establish a scientific, appropriate and efficient system to guarantee the order of the carrying out of academic advising.

In terms of dividing the contents of academic advising, we should establish a categorizing system from the whole to the parts, to plan it as a whole, and try to include all the academic advising students need during their college development, so as to facilitate the categorization of academic advising. In terms of form, it should be a system of collaboration between the high and the lower part, which means it should be the combination of school, faculty and independent organizations. We should carry out academic advising through seminars, one-on-one, workshops and multiple measures, insisting on the combination of individual and group advising, of tutor and peer advising, of academic course and development advising, to build an all-dimensional academic advising, and reinforcing the coordination of resources, contents, methods in order to reach the whole collaboration of academic advising.

(3) Building the academic advising team to improve the expertise

University education should not only have professors and executive personnel, but also specialized personnel who can deal with individual problems that students encounter in their studies and offer professional help for their academic development. This not only lessens the pressure of the professors but also helps to implement more overall educational work, which is the true example of the "student-centered" educational concept. It has become the trend in university education to organize an academic advising team equipped with personnel who has practical experience and professional knowledge.

The establishment of specialized academic advising teams in Chinese universities can take reference from the setting of experts in American universities. Universities can set up special institutions and organizations or hire people with diversified educational background which includes studying, transferring majors, double degree, postgraduate exams, etc., as responsible for designing the academic advising plan, creating the atmosphere of humanistic care, improving students' knowledge about academic advising, and most importantly, doing academic advising work frequently and offering students help as they need it. On the faculty level, we rely on the tutor system and lecturers to carry out unscheduled academic advising which is also more appropriate in terms of the characteristics of the subjects and of students' academic career. In addition, we need to improve the professional level of the staff working in academic advising, to cultivate their

consciousness of continuous learning, make sure they master the professional knowledge needed for academic advising, and actively explore a functional and effective working mode, to continuously boost the investigation and practice of students' academic advising.

(4) Forming the academic advising strategy to advance the pertinence of academic advising

Academic advising should consider students' development as a common and wholesome process, and the interaction with students as the educational process to cultivate "healthy and all-rounded individuals and citizens in a liberal society", focusing on students' harmonious development of their intellect, morality, sensibility and life^[18,19]. So, academic advising should take into consideration the changes students go through from freshmen to seniors in their development, and carry out pertinent advising according to their different development phase and situation, and their particular academic problems, in order to improve the efficiency of academic advising.

First of all, in the beginning of academic advising, we should shorten our distance with students to build relationships and learn about students' background through informal chats, which reinforces our grasp of students' personal characteristics, experience and control over the future. Secondly, during the process of academic advising, we should encourage students to rethink, to deepen and make their self-definition more accurate in terms of value, personality, ability, specialty and faith, etc. In the meantime, we help students know more about the talents training goal, task, environment and all kinds of resources that the university provides to students, enrich their knowledge about the university in order to form their academic goals. Thirdly, the most targeted of the academic advising should be students who encounter difficulties in their studies and those who have specialized needs. Academic advisers cannot make decisions for students, but can give them advice through listening, communicating and sharing their own experience, and encourage them to explore new options and make decisions on their own. They can help students plan their academic career and in the meantime help them establishing connection with other students and teachers, so as to obtain more suggestions, and clarify their options. Academic advising is a long-term process, which involves understanding students' different needs at different phases though interacting with them, in order to take different working measures and finally helping students realizing their personal goals.

(5) Widen the scope of academic advising

Academic advising working content should not only be focused on students' studying difficulties and studying activities direction, but also on the collaboration with other departments and faculties inside the university and fully focus on student's study plan, academic goal and other process during their whole academic career, enriching the academic advising content, and make it more pertinent to every phase in the university experience so it's more well-rounded and diversified. We should focus more on entrance education, course-choosing and adaptation to college studies when they enter university; on professional advising related to course studying methods when they are in the end of every semester; on strategic and directive advising when they want to change majors, further their studies or when they are graduating. In this way, academic advising can be an important tool for students' whole academic development.

To sum up, in the current trend of the deepening of the reformation of higher education, a more open and autonomous educational method has become more and more important. Students encounter so many problems when they transit from an education that is exams-centered to university education, so that it is of vital importance for student

growth and improving the level of higher education of China to evaluate students' studying activities and mind-body development from the first to the fourth year and to carry out pertinent academic advising.

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