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Chunliang Zhang
Editors

Engineering Education and Management

Vol 2, Results of the 2011 International Conference
on Engineering Education and Management (ICEEM2011)

Lecture Notes in Electrical Engineering

Volume 112

Liangchi Zhang and Chunliang Zhang (Eds.)

Engineering Education and Management

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Conference on Engineering Education
and Management (ICEEM2011)

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ISBN 978-3-642-24819-1

e-ISBN 978-3-642-24820-7

DOI 10.1007/978-3-642-24820-7

Lecture Notes in Electrical Engineering ISSN 1876-1100

Library of Congress Control Number: 2011939479

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Typeset & Cover Design: Scientific Publishing Services Pvt. Ltd., Chennai, India.

Printed on acid-free paper

9 8 7 6 5 4 3 2 1

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The Dynamic Process of Education Expenditure Distribution in Each Region of China

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Abstract. This paper gave an analysis on the dynamic process of education expenditure in China with the Kernel density and Markov chain. The results showed: the differences of per capita education spending was big in each region, with the lower gradient layout from the east to west; the distribution of kernel density functions displayed a “Bactrian” collecting trend which further represented a severe polarization in education expenditure, since 1995, the regional differences had continued to be expanding; from the steady distribution of Markov chain, the per capita education spending in each region still had a great discrepancy and it was difficult to achieve balanced development in short time.

Keywords: Education expenditure, Kernel density functions, The Markov chain, China.

1 Introduction

Since the 1978’ reform and opening up policy, China’s economy has developed rapidly, thus the financial input in education are increased which promoted the development of education. The development of education provides high-quality labor force for economic development and further promote economic growth, and the two factors forms positive cycle. Though the Chinese education is in the rapid development, it has regional imbalance. Due to the geographical, economic development and its own factors of education which led to the bigger and bigger differences between eastern and western regions. The main cause is the diversity of education expenditure.

In recent years, the difference of per-capita education expenditure has caused the scholars’ attention and the scholars analyzed it from different angles. From the literatures, at present, the various indicators of education expenditure differences are from the economics methods, the usual indicators includes the standard deviation, range, lorenz curve, the gini coefficient and the variable factors. But these methods are a common fault, which is they can outdo the dynamic and long-term trends. Being difference from the past researches, this paper gave an analysis on the dynamic process of education expenditure distribution in each region of China from 1990 to 2010 with the dynamic distribution method (MEDD).

2 The Research Method

The dynamic distribution method can directly describe the distribution shape of variables and dynamic process as the time past by, and it has a distinct advantage over the traditional research method, and it is an estimation method which can more describe the phenomenon of the parameters. The dynamic distribution method(MEDD)includes kernel density functions and Markov chain, the former regards a sequence as a continuous state, and the latter regards a sequence as discrete.

2.1 The Kernel Density Estimation Method

The kernel density estimation is mainly used to estimate the random variable functions, supposing the random variable functions X_1, X_2, \dots, X_N are in the same distribution, and the kernel density function is $f(x)$, the distribution function is the following:

$$F_n(y) = \frac{1}{N} \sum_{i=1}^N I(X_i \leq y) \quad (1)$$

In formula (1), N is the number of observations, $I(z)$ is the indicators function, Z is the conditions formula; when Z is real, $I(z) = 1$, or $I(z) = 0$. The kernel density estimation is as the following:

$$f(x) = \frac{1}{hN} \sum_{i=1}^N \eta\left(\frac{x - X_i}{h}\right) \quad (2)$$

In formula (2), h is the bandwidth, η is the kernel density function.

2.2 The Markov Chain Method

Supposing there is a random process $x(t)$, the probability from the state i in period t to state j in period t+1 is P_{ij} , in period t, the probability in s_i state is $a_i(t)$, so there is the following formula.

$$a_i(t+1) = \sum_{i=1}^n a_i(t) p_{ij} \quad (i = 1, 2, \dots, n) \quad (3)$$

That is to say, the probability in period t+1 is closely relevant with that in period t, and it is not relevant with the former one, the state of transfer process is called Markov chain method.

3 Empirical Analysis

3.1 *The Kernel Density Estimation of per Capita Education Investment*

In order to further reveal the dynamic process of education expenditure distribution in each region, we chose Epanechnikov kernel function and Silverman best bandwidth, and gave the density distribution of education expenditure in main years by the kernel density estimation method. The results are in the following.

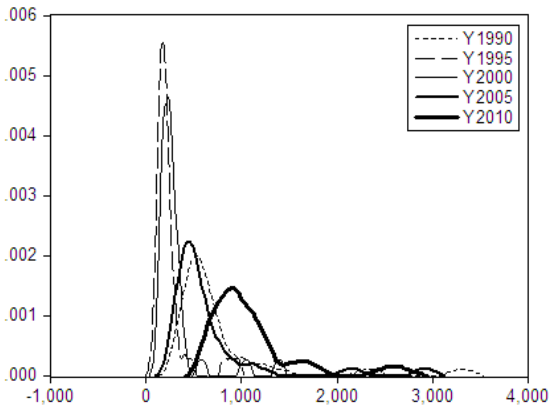


Fig. 1. The Dynamic Process of Education Expenditure Distribution

In the Figure 1, the horizontal axis represents average educational funds, the vertical axis represents density. From the two years of 1990 and 1995, the wave is higher and higher, and the right tail turns left which shows the average educational funds is polarization in this time, and the polarization gradually reduced. From the years of 1995 to 2010, the wave is lower and lower, and the right tail turns right and extending which shows the average educational funds increase in this time, and the polarization gradually expand.

3.2 *The Transferring Probability Matrix of Relative per Capita Educational Funds*

The relative per capita education spending is the total of education investment divided by population in an area. According to the overall level, we select four nodes value (0.5, 0.75, 1.0, 1.25). The relative per capita education expenditure are classified into five groups of A,B,C,D and E. Calculating the transferring probability matrix and the steady distribution by Markov chain.

Table 1. The Transferring Probability Matrix and Steady Distribution

Type	X<0.5	0.5-0.75	0.75-1.00	1.00-1.25	X≥1.25
X<0.5	0.75	0.25			
0.5-0.75	0.051	0.823	0.126		
0.75-1.00		0.165	0.572	0.138	
1.00-1.25			0.191	0.571	0.238
X≥1.25				0.15	0.85
the steady distribution	0.06	0.295	0.225	0.163	0.258

The 1st column in table 1 is the per capita educational funds in t period; the 1st line is the sample state in t+1 period. The last line is the steady distribution. From the transferring probability matrix, the change of per capita educational funds is stable. The greater of elements on the diagonal which means the higher probability of regional per capita education in the next issue remains that of the last period. From the table 1, we can see the least element on the diagonal is 0.571, the greater is 0.85, and the average is 0.713 which means the probability of regional per capita education in the next issue remains that of the last period is 71.3%, the changes has the “sticky”. Therefore, if the per capita education funds in various areas of China is still in the past trends, then the per capita education investment will still keep considerable differences, and it is difficult to achieve balanced development in short time.

4 Conclusion

By the Kernel density and Markov chain, this paper gave an analysis on the dynamic process of education expenditure in each region of China. The results showed: the per capita education expenditure had a great difference, with the lower gradient layout from the east to west; it displayed a “Bactrian” collecting trend which further represented a severe polarization in education expenditure; since 1995, the regional difference had continued to be expanding; and we can see from the steady distribution of Markov chain, the per capita education spending in each region still had a great discrepancy and it was not possible to achieve balanced development in short time.

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Cultivation of University Teachers' Education Technology Ability - A Study on the Strategies Basing on Learning Community

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Abstract. This article introduces the present situations and existing issues about education technology ability of university teachers, then comprehensively introduces learning community of university teachers' education technology ability basing on group dynamic, which summaries the connection between group dynamic and learning community of university teachers' education technology ability. On this basis, the paper discusses the realizing ways of education technology ability of learning community of university teachers, and offers two ideas: one is traditional university education technology learning community, which mainly considers "school-based research, regional intercollegiate cooperation" as the platform, providing university teachers with chances to discuss and have a face-to-face communication. The other is university teachers' education technology learning community in the network environment, expecting to show some certain guiding functions.

Keywords: University teachers, Education technology ability, Learning community.

1 The Present Situation and Existing Issues about Education Technology Ability of University Teachers

When human fully step into the information society- the 21century, information technology has made tremendous influence on education, and that makes education technology ability become a significant part of the teachers' professional abilities. Only the university teacher improve their education technology ability constantly, can they adjust the new situation of the educational informatization.

From 2009.9 to 2010.12, through the design of the questionnaire "University Teacher Education Technology Ability and Training Practice Questionnaire" and informal discussions, the author carries out an random sampling survey into the Zhoukou Normal University in Henan province and another 5 universities, which mainly focuses on the present situation about teachers' education technology ability, training and advices on cultivation. Among them, 550 questionnaires are distributed, 336 are retrieved (recovery rate 61.1%), and 321 questionnaires are valid (effective rate 97.3%). As the survey shows, there are several major issues on education technology ability and training.

1.1 “Free development” - The Common Phenomenon of Education Technology Ability among University Teachers

“Free development” of education technology ability among university teachers reflects itself in two aspects. One is individual success value and the other is uninventionism of the universities. The main particularities of teaching as a profession lie in the fact that it is the teacher himself that finishes the whole teaching task. They refuse to upgrade themselves by turning to other teachers or experts for help, but acquire knowledge on teaching research through their solitary and incomplete teaching experience, so the universities have to demand their teachers to exchange valuable ideas through mutual class-listening administratively. For those teachers, only few available notes can be found on their lecture records, which are far from the deep thinking about teaching research in information technology environment. The phenomenon that university teachers continue to “fight” solely instead of giving substantial criticism and instructions to their colleagues represents that they are actually in a self-closed and negatively conservative condition, which is neither conducive to professional development nor to the improvement of their technology.

According to the survey, a great number of teachers believe that their workload is exceedingly heavy. Teachers overloaded account for 41.0%. However, only 22% teachers hold the view that they don’t explore their potential to the most extent, and teachers with little workload are few, which reveals that teachers, in college or in high school, are working under great pressure. The survey also shows that a good many teachers indicate that there is a remarkable improvement after their induction as teachers, of whom about 35.7% teachers feel that they have a prominent improvement, while 51.8% teachers get slight improvement. Nevertheless, those improvements is gained mainly by using the way of self-cultivation (45.9%), and scientific research (44.9%), yet it is relatively low in the proportion of training attendance (1.67%), academic activities (14.1%), diploma education (11.5%) and investigation (6.6%). In conclusion, the development of education technology ability of college teacher must be guaranteed by a certain amount of time and energy, while lacking one of each will surely exert an influence on teachers’ input in self-improvement. What’s more, self-practice of university teachers can only be a slogan with the deficiency of persistence and systematization.

1.2 The Obvious Limitations of Traditional Ways That University Teachers Are Trained in Education Technology Ability

The traditional ways of training in education technology ability of university teachers are mainly, from up to down, led by government or college, thus the organizers of the training place more emphasis on overall size and effect. And the training is always a single way transmission, with drawbacks like single model and poor pertinence. Moreover the teachers trained are dominated, therefore they respond in a passive and negative way, leading to great limitations. These limitations are mainly that: firstly, the goals of training are not clear. So far, there does

not exist a comparatively complete and effective criterion for training faculty in information technology and curriculum integration. Many educational technology trainings fail to enable teachers to solve the practical problems encountered in teaching, and that is because what these kinds of trainings require is that teachers should attend several training classes, participating in the assessment, and finally succeeds to get a certificate at the end of the training; secondly, the training is characterized by single mode. Methods like mere installation and spoon-feeding are still adopted in quite some training, and particularities of adult-learners are not taken into consideration at all. This mode of group operations and uniform training ends up with a mere formality, with no effect to stimulate the enthusiasm and interest of the faculty in learning, let alone to exert the subjectivity, initiative and creativity as well as the effect of training. Thirdly, impetus of the group is ignored. Though the training is always attended by several dozens of teachers, the exertion of this kind of impetus is not taken into account. What is more, there is a serious lack of communication and collaboration among teachers, as some even fail to tell who are sitting beside him or her after the training, which makes it more difficult to effectively improve the education technology ability of the faculty; fourthly, assessments of the training is more emphasized than the process. In the education technology ability training, the changes of ideology, teaching philosophy, teaching methods happened to the faculty are paid less attention than the results, leading to the fact that the training is regarded as formality with little significance.

2 Education Technology Ability Learning Community of Teachers Based on Group Dynamic

2.1 Intension of Group Dynamic

The founder of group dynamic theory is Lewin. Group dynamic refers to the flow of will which leads the group. It aims at discovering the psychological and environmental aspects in the sources of group dynamic which pushes members of a group forward. A group dynamic system generally consists of three main factors – cohesion, drive and dissipative force. These factors can influence group members at the same time. They transact with each other and contend with each other. All three factors make contributions to the evolution and development of a group through the process of transformation from one to another. Cohesion assures the stability of a group. Drive makes a group keep developing and evolving. Dissipative force, however, is a negative factor which hinders a group from progressing and lowers the work efficiency.

Keep good man company, and you shall be of the number. Every teacher has a strong sense of belonging to the community. No one would like to be discarded by other group members. To improve the education technology ability of teachers, it's better to start from changing a particular group of them. To do a research on education technology ability of teachers, not only should we study individual development, but also study group development. Education technology ability learning community is the inevitable outcome of group dynamic theory.

2.2 Education Technology Ability Learning Community of Teachers

Education technology ability learning community of teachers is a group which aims at improving the education technology ability and other professional abilities of university teachers. It's organized by volunteers in universities. A learning community which aims at improving education technology ability usually includes teachers and educational technology experts. Constructing it can help teachers to exchange teaching experience and methods. It can also help them to solve the teaching problems and share what they've learned in teaching. Thus, the learning community could promote the development of both knowledge and ability. What's more, it will establish a cooperating community basing on education technology and improve teachers' abilities on education technology research. University education technology learning community which bases on group dynamics has some typical characteristics. One is target cohesion. What university education technology learning community struggles for is a goal—enhancement of education technology ability. The encouraging feature of particular goal determines teachers' role in directing and driving actions. Group goal is one of the important factors that generate cohesion. University teachers as individuals are attracted by the group goal and internalize it to their own pursuit, which will produce strong independence and belonging psychology. The attraction will be greater when the goal is particularly challenging and individual fully perform his or her self-value. Self-achievement comes to the second. Binding force from group forms and stress, as the driving force, which changes and maintains university education technology learning community, is influencing and promoting individual's initiatives and reduces energy wasting.

2.3 Realization of Education Technology Learning Community of Teachers

One is traditional university education technology learning community, which mainly considers “school-based research, regional intercollegiate cooperation” as the platform, providing university teachers with chances to discuss and have a face-to-face communication. The platform is fully related to actual work. They can learn from each other while experts are discussing or sharing ideas together, so they can adopt the others' strong points and overcome their own weak points, making progress together. University education technology learning community, basing on university teachers' voluntary and mutual recognition, is both a simple and efficient grass-roots research team. Cooperation development of university education technology learning community adapts some main forms, including target cooperative communication and case analysis communication. The former is established by teachers who have the need to develop themselves, recognizing each other and then organizing a learning community voluntarily. They make their

action plan and create a cooperative atmosphere. For example, two university teachers could prepare lessons, design lessons, and discuss cases jointly to complete the program research or program study related to education technology. Accordingly, university teachers can achieve their self-development in the process of joint exploring and experiencing. With case analysis communication carrying out and internal or inter-school observing teaching activities holding, university teachers take an active part in them and have good interaction. Along with the issues raising and analyzing, university teachers feel positive self-denial and enjoy the sense of achievement from peers as well. Their education technology ability has been improved, so has their professionalism completed.

The other is university teachers' education technology learning community in the network environment. University teachers' education technology learning community in the network environment is that individual university teachers (experts in the field, excellent teachers and peers) comprise the technology learning community. With the help of necessary support provided by the network environment, university teachers in the traditional education technology learning community can only communicate and cooperate with each other in an environment limited to space and time. Nevertheless, the learning community in the network environment is relatively virtual, which is often not real-time face-to-face communication but more through theoretical and practical knowledge exchange and exploration. It's good for the promotion of teachers' professionalism and their abilities of sustainable development. On the one hand, as the subjects and active constructors of education technology ability, individual university teachers actively attain real-time or non real-time help in the network environment. On the other hand, they are also the collaborators of learning community and designers of resources who provide learning opportunities for other individual university teachers. University teachers' education technology learning community can be composed of university teachers from the same region as well as from different regions, regardless of time and space.

3 Conclusion

University learning community is an organization, which can transform study to create, explore self energy. It is also a reversion to discourse right and the awakening of self-consciousness of university teacher. Every teacher in the learning community will be able to take the initiative to their researches, reviewing their teaching behaviors and carrying out individual study and bolding innovation efficiently. Most importantly, all the members will work hard together towards their common and special target, and the fulfillment of education technology ability. Today, "Technology can not take the teachers' place, but the teachers taking advantage of technology will replace those who do not use technology". In view of the research and practice on university teacher learning community, it will make positive impact on the training of the teachers' educational technology ability and the development of teachers' professional abilities.

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The Elective Course Setting Reform in the Perspective of Behavioral Decision Theory

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Abstract. The elective courses are an important part of curriculum setting and personnel training program in the university, and also are important projects to implement the quality education and highlight the importance of students' personality. At present, some universities have a number of issues in the curriculum, teaching staff, teaching resources and assessment mechanism in the elective course system. Try to introduce behavioral decision theory of the economics into university elective course system to strengthen the course reform in the form of decision-making framework and empirical research.

Keywords: Behavioral Decision Theory, University, Elective Course System Reform.

1 Introduction

University elective courses are courses available to students in other majors to learn the expertise of other courses in higher education. This is a conventional system in the higher education system that combines the interest and becomes multidisciplinary experience. It gives full play to students' initiative and independence of creativity, and expand the professional caliber, and develop students' quality and ability. Moreover, it also improves the teaching and research ability of teachers and improve the university curriculum system. Therefore, public elective teaching is experiment about teaching innovation and the interactive platform for teachers and students that plays an important role in the university teaching system. But with the gradual reform of university curriculum in depth, the contradictions and problems in the elective courses system becomes increasingly obvious. The paper brings in behavioral decision theory in the economics into university elective course system to strengthen the course reform in the form of decision-making framework and empirical research.

2 General Foundations of Behavioral Decision Theory

Behavioral decision theory has the following characteristics: First, the starting point is the decision maker's decision-making behavior; Second, the study focuses on the decision-maker's cognitive and subjective psychological processes, and concerns the psychological explanation behind the decision-making behavior, rather than the evaluation about whether the decision is wrong or not; Third, from the perspective of cognitive psychology, it studies the mechanism of determining and processing the information and the impact of internal and external environment, and then extracts behavioral variables that the rational decision theory does not take into account to amend and improve the rational decision model. The general paradigm of behavioral decision theory is: to put forward the hypothesis about people's behavioral characteristics--- to confirm or falsify the hypothesis ---- to get the conclusion. Behavioral decision theory's main contents include much. The human's rationality is between complete rationality and irrationality. The decision-makers is easy to be affected by the perceptual Bias in the recognition and perception of problems. Due to the limited time and available resources, it is impossible for the decision-makers to understand and master all the information and intelligence about decision-making environment. At the same time, decision-makers are often risk-averse and less inclined to accept the risks of the program. Decision-makers in decision-making often seek only satisfactory results, rather than seek the best efforts.

3 The Elective Course Setting Problems in the Perspective of Behavioral Decision Theory

3.1 Behavior's Limited Rationality Results in That the Curriculum System Is Inconsistent with the Training Objectives

Behavioral decision theory suggests that people are bounded rational. In the extremely complex realistic decision-making environment, human's knowledge, imagination, and computing power is limited. There is a big limitation of elective courses set, which is single in category .Most contents are inclined to focus on history class and literature and history, and courses involved with natural science and practice are in the minority and not practical, for example, Spanish, art appreciation, chorus and command, philosophy history, etc. Most students are not interested, and such courses for most students in other majors in the future study and work are seldom used, which , however, has become general courses. This is contrary to the original intention and goal and also the result of subject's bounded rationality.

3.2 The Perceptual Bias of Decision-Makers Results in That the Contents of Public Elective Course Do Not Match Its Form

Decision-makers are easy to be influenced by the perceptual bias in the problem identification .When they judge the state of the future, they use the intuition more than logic analysis methods. The so-called perceptual bias is that due to the limited cognitive ability, decision-makers only regard the part of problem information as the cognitive object. However, it is inevitable to be influenced by perceptual bias. They often focus only on theory and concepts and neglect the practice and practical ability in the teaching process. The rough quality of teaching goes against the teaching program. In the short term there is little teaching effect, resulting in great contradiction between content and form of elective courses.

3.3 That Decision-Makers Don't Seek the Best Solution Results in That the Teaching Quality Is Not Guaranteed

Decision-makers often seek satisfactory results, rather than seek the best efforts. Decision-makers do not continue the study with others positively , and they are often content with the current viable options. On the one hand, as elective courses are rich in contents, involving a broader range of knowledge and professional experience, it proposed more strict requirements to teachers. But under normal circumstances, teachers have heavy teaching tasks, which leads to that they put less energy in elective courses, and do not pay enough to support decision-making, and affect the teaching quality ;On the other hand, the university's teaching resources are limited, and some courses can not meet the course requirements and the teaching needs in multimedia equipment, laboratory, information and other aspects. In the management system reform process of the implementation of the autonomy of university education in China and highlighting the characteristics of the school, teachers' ability to open courses become one of restricted factors.

4 The Elective Course Setting Reform Path in the Perspective of Behavioral Decision Theory

4.1 Take Full Advantage of the Limited Human Rationality, Improve the Curriculum System According to the Training Objectives

When behaviors face and make choices, affected by the objective and subjective environment ,they can not always do a rational decision making. As social and economic development comes up with more professional and more high-end requirements,it requires that colleges and students should develop people's bounded

rationality to make decisions with the greatest degree. Universities should set up the corresponding courses according to the current needs of the students and their general desire, and focus on interdisciplinarity and innovation, for example, real estate marketing, appliance repairing, health care, disease diagnosis will attract more students, and courses will provide students with the platform for skills enhance. About the elective course system setting, we should set up the strict examination and approval system for public elective courses, and strengthen the assessment of work.

4.2 Overcome the Perceptual Bias, and Focus on Curriculum Innovation and Practical Ability

Today's society, decision-making from the subject behavior is influenced by social systems, historical and cultural traditions and the relationship between human beings and other factors. The universities have the burden to develop the college talents for the society. Innovative teaching of elective courses is becoming the center of the higher education. In addition to regular teaching, university can use elective course curriculum to improve innovative teaching experimentation and practice, and improve the proportion of experimental teaching and social practices. And they can enhance knowledge ability through practical methods, and require students to finish courses with investigating reports, thesis, or examinations manner elective assessment.

4.3 Seek the Best Program, Strengthen Teachers' Training, and Cultivate Excellent Teachers

Therefore, we must further improve the training of college teachers to improve the quality and meet the requirements of college better. The universities should adjust the content and curriculum of teachers' pre-service training, implement modern educational technology training and carry out the good international project about cooperation of key teachers training, and improve teacher training management system and operation mechanism. Meanwhile, in order to meet students' need and develop qualified personnel, universities should increase investment in education, including improving the teaching facilities and professional training for teachers. Invite experts in related fields to give the necessary teaching and support to improve the overall level of university teachers.

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