Application of Practical Curriculum for College Specialty of Economic Management under TPACK Framework

Taking "Enterprise Operation and Decision Simulation System" Curriculum as an Example

https://doi.org/10.3991/ijet.v12i07.7223

Tao Tian*
Anhui Agricultural University, Hefei, China
ahtt2009@sohu.com

Nengfeng Zou
Anhui Agricultural University, Hefei, China

Jiyu Jiang
Anhui Agricultural University, Hefei, China

Xiaochun Xu
Anhui Agricultural University, Hefei, China

Abstract—As a new type of educational knowledge integration framework under the appeal for informatization, Technological Pedagogical and Content Knowledge (TPACK) has become a prerequisite for teachers to integrate technologies into their teaching effectively. A comprehensive analysis of the current challenges faced by practical curriculums on economic management is presented in this paper. A curriculum design model was constructed based on the TPACK theoretic framework and the constructivism learning theory. The curriculum "Enterprise Operation and Decision Simulation System" was taken as an example, and the practical curriculum system for economic management under the TPACK framework was designed from three aspects, namely, teaching content, teaching methodology, and teaching technique. On this basis, an econometric analysis software was used to analyze the effects of curriculum implementation. Research indicates that TPACK plays a significant role in improving teaching quality, elevating student satisfaction, and cultivating students' professional application and practice abilities. The research conclusion is of certain reference value to the practical teaching reform and development in universities.

Keywords—TPACK, Teaching Methodology, Teaching Content, Teaching Technique

1 Introduction

With the development of computer and network technology, information technology, which has been extensively applied to practical teaching in the economic management specialization, has obtained favorable effects on improving the abilities of college students in linking theory with practice and cultivating comprehensive applied talents. However, in current practical teaching processes, institutions of higher learning have attached more importance to technological introduction, but less on how to exert technological functions [1]. The effective use of information technology in teaching has become a new challenge for teachers with the continuous innovation of educational paradigms, rapid development of information technology, and update in teaching content.

To improve the teaching quality of practical curriculums on economic management, scholars have pointed out that the construction of the knowledge system of practical curriculums on economic management should be intensified and the professional knowledge content, especially the application-type content, should be enriched [2]. Scholars have discovered that practical curriculums should emphasize the diversity of teaching methodologies and different teaching strategies and skills should be used to improve the curriculum teaching quality and heighten the interests of students in learning [3]. Furthermore, several scholars believe that the comprehensive application of present information technologies, such as network teaching software and large-scale online courses, is of considerable significance to improving practical teaching quality [4]. Teaching technique, teaching methodology, and teaching content supplement each other; thus, only when they are effectively integrated will favorable effects be obtained [5].

In 2005, American scholars Mishra and Koehler proposed the concept of TPACK based on pedagogical content knowledge and pointed out that TPACK is a complex knowledge with information technology integrated into classroom teaching and a new type of knowledge form that exceeds the three types of key knowledge, namely, disciplinary content, teaching methodology, and educational technology; these types are effectively integrated by teachers [6]. In recent years, a few experts and scholars from both home and abroad have been dedicated to the development of the theoretical framework, TPACK, and its applied research in teaching practice and have obtained a favorable effect [7]. Research shows that TPACK is currently the most effective and most welcomed pattern by numerous teachers in America in terms of information technology and intra-curricular integration [8]. TPACK-based curriculum teaching design can maximize the features of information technology; for example, the application of integrated interactive electronic whiteboard can effectively improve visual expression and visual manipulation effects in classroom teaching, thereby deepening students' understanding of knowledge points and improving their learning efficiency [9]. In the aspect of teacher cultivation, scholars have used the TPACK framework to formulate corresponding teacher cultivating patterns and strategies [10].

However, relatively few research achievements have been attained in the aspects of curriculum design and application based on the TPACK framework. Taking full advantage of modern information technology and integrating the disciplinary knowledge

in the economic management specialization into practical teaching are important directions toward improving teaching quality and constitute the key to cultivating applied talents [11]. Hence, a system that effectively integrates information technology with teaching contents and teaching practice should be constructed to facilitate the reform and development of practical curriculums of the economic management specialization.

On this basis, a design model was constructed in this study starting from the TPACK framework, and modern information technology was used to simulate a practical scene. The curriculum "Enterprise Operation and Decision Simulation System" (EODSS) was taken as an example, the practical curriculum design and application of the economic management specialization was explored, and the application effects were analyzed.

2 Theoretical Basis for Curriculum Design under TPACK Framework

2.1 TPACK knowledge framework theory

As a new type of disciplinary knowledge framework, TPACK exhibits the core appeal for knowledge technology that is needed by disciplinary information-based teaching. TPACK is rooted in three core elements, namely, technical knowledge, pedagogical knowledge, and content knowledge. These core elements are intercrossed and overlapped to form new interactive elements, namely, technological pedagogical knowledge, technological content knowledge, and pedagogical content knowledge. The knowledge at the intersections of the three core elements is called TPACK, as shown in Fig. 1. The TPACK system must focus on the interactive reflection of these elements. The value of the TPACK framework lies in describing the thinking process of complicated systems, thereby providing a reference for effective technological integration and facilitating the professional development of teachers.

In this study, technical knowledge consists of knowledge about basic techniques, such as books, chalk box, and blackboard, and all types of advanced techniques, such as PPT, network teaching, and video. Technical knowledge also includes specific techniques and skills that are required for teacher–student interaction. Teaching methodological knowledge reflects the skills and methodologies used during the teaching and learning process of curriculums on economic management. Content knowledge mainly refers to taught or learned disciplinary knowledge on economic management, which mainly includes relevant concepts, theories, framework knowledge, opinions, evidences and practice, and the method constructed by the knowledge system. Three core elements construct a "technique–knowledge–methodology" system such that complicated and dynamic relationships between the disciplinary content, teaching methodology, and technique are formed and information technology can permeate into and deeply influence the disciplinary curriculum.

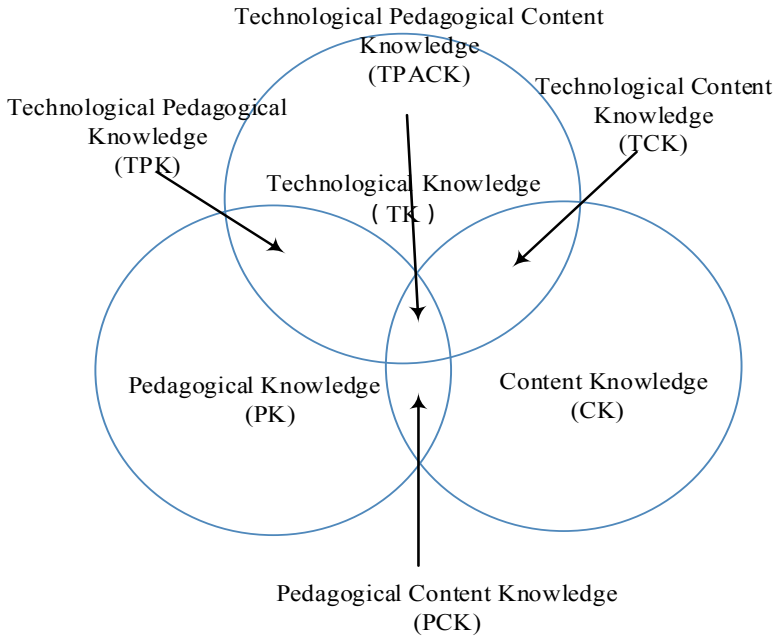


Fig. 1. Knowledge Framework Structure of TPACK

2.2 Constructivism learning theory

Constructivism learning theory, which originated in the 1980s, is a branch of cognitive psychology that aims at revealing the cognitive laws of the human learning process [12]. Constructivism learning theory posits that learning is a dynamic process of initiative construction via active construction of real scenes by teachers and learners in which the creation of real problem and learning scenes and the construction of a collaborative learning pattern are the key factors. Teachers and learners consciously and proactively construct knowledge meaning. During the learning process, a "teacher-directed and student subject" interactive relationship is established, learners deepen their learning and understanding of new knowledge based on existing individual experiences and knowledge, and teachers should help students organically integrate new and old knowledge to cultivate the abilities of students in analyzing and solving problems and maximize their subjective initiative and creativity.

3 Curriculum Design Model under TPACK Framework

As a knowledge framework for teachers to integrate techniques, TPACK focuses on how to carry out the organic integration of "teaching technique, teaching methodology, and teaching content" based on the TPACK knowledge. Furthermore, the flexible combination of "students being the subject" and "teacher leading" is carried out to improve the learning effects on students.

On the basis of the above research achievements and theoretical foundation, the curriculum design model under the TPACK framework is constructed in four phases. In the first phase, the curriculum design and development principles under the TPACK framework are determined based on the analysis of the TPACK development framework and the definition of the curriculum concept. In the second phase, on the basis of the three constitutive elements of TPACK and the curriculum features, demand and conditional analysis of the curriculum design under the TPACK framework is conducted. In the third phase, curriculum design and implementation under the TPACK framework is carried out based on the analysis of the design principles and demand and the conditional analysis. In the fourth phase, curriculum evaluation under the TPACK framework is conducted as seen in Fig. 2.

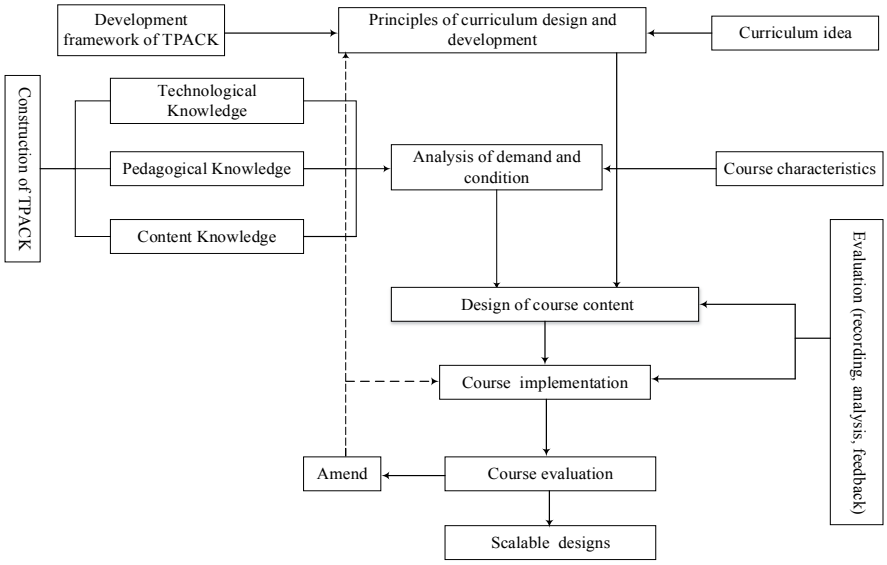


Fig. 2. Curriculum Design Model under TPACK Framework

4 Practical Curriculum Design and Application for College Specialty of Economic Management under TPACK Framework

In the practical curriculum of the economic management specialization, the EODSS curriculum was selected in this research based on the curriculum design model under the TPACK framework to carry out design and application.

4.1 Curriculum features and design concepts

The EODSS curriculum, which is one of the practical curriculums in the curriculum system of the economic management specialization in Anhui Agricultural Col-

lege, uses the simulation technique and introduces competitive mechanism to construct several simulated enterprises that compete with each other. During the process, students play the roles of managers at different hierarchies and in different departments in enterprises, integrate disperse knowledge points about business management, and apply professional knowledge in decision-making and competition counteraction to reach the goal of cultivating the comprehensive abilities of students in operations management.

4.2 Design of curriculum contents

The design of the teaching content, teaching methodology, and teaching technique of the EODSS curriculum under the TPACK framework is as shown in Fig. 3.

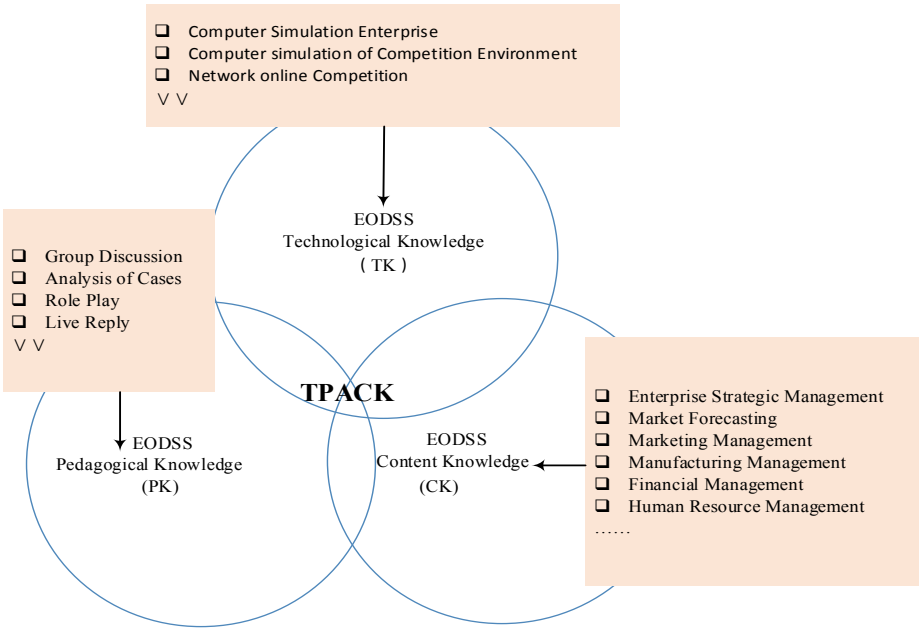


Fig. 3. Curriculum Design of EODSS under the TPACK Framework

4.2.1 Design the decision-making practical system platform

For the sufficient utilization of the modern information technology and modern management science, the EODSS curriculum in Anhui Agricultural College employed the modern business decision-making simulation software developed by Donghua College. This software adopts the intelligent control technique to construct the computer itself into a competitive enterprise with autonomous decision-making optimization ability to achieve intelligent operations, such as the automatic adjustment of business environment, process control, and results analysis and evaluation.

4.2.2 Design teaching contents for EODSS

Enterprise operation and management has strong practicality and comprehensiveness. The EODSS curriculum is employed to integrate the knowledge points of all types of disciplines on economic management organically and simulate the whole decision-making process for business operations via the students' application of theoretical knowledge in the practical curriculum. Through decision-making and the management of all kinds of problems during the business operation process, students will have a practical understanding of the essential features and inherent laws of business operations to stimulate their innovative consciousness and improve their comprehension, practicality, and innovativeness in business management decision-making.

When carrying out man–machine counteraction and group counteraction, students must make decisions for the main operating activities. After entering the operating decision data, students must conduct evaluation and implement decision schemes via comprehensive budgets (as seen in Fig. 4), adjust the decision data, and make final decision schemes. The server will operate according to the enterprise and computer decision schemes or decision schemes of groups and then output the competition results.

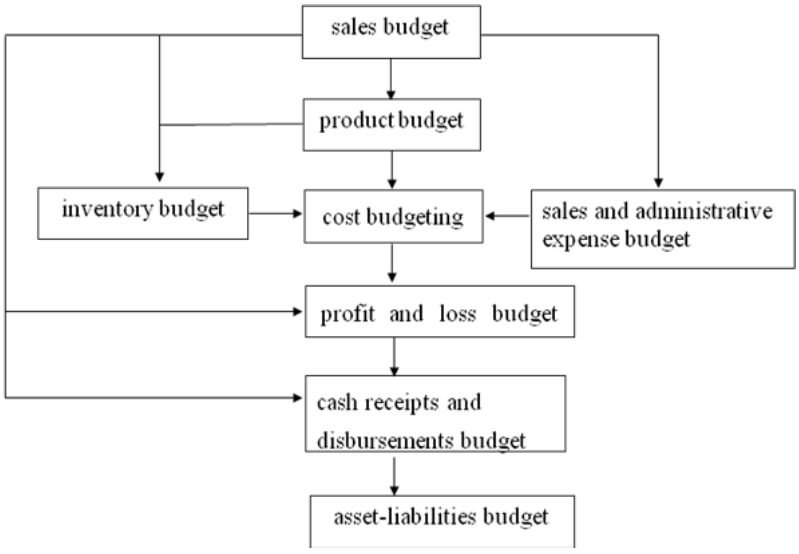


Fig. 4. Comprehensive Budget System for Business Decisions

4.2.3 Design teaching methodology of the EODSS

The initial phase of the EODSS curriculum centers on the teaching methodology of core knowledge retrospection. Teachers adopt teaching methodologies, such as questioning, inspiring, and rhetorical questions, to guide students in their reflection of the content of professional curriculums on economic management and strengthen their cognition and memory of knowledge points.

Implementation phase of the EODSS curriculum centers on the teaching methodology of technical process. Teachers adopt the expository, case discussion, and student role playing methods to carry out the teaching contents. First, the practical curriculum process is explained. The case method is used to guide students in their application of knowledge points to address enterprise decision-making problems and accelerate the familiarity of students of the system operating pattern and method. Second, the role playing method is used to encourage students to organize and establish an enterprise, bear various management work, and gain a deep understanding of the job contents of the enterprise and apply theoretical methods.

The initial phase of the EODSS centers on the open and interactive teaching methodology. Interactive communication is carried out through the reporting, defense, and discussion of students, and teachers seek the good measures and deficiencies of participating enterprises by guiding and evaluating the enterprise management performance of all the groups. Furthermore, the enthusiasm of students in finding and solving problems is stimulated, their team awareness is enhanced, and their comprehensive quality and ability in decision-making in the economic management perspective are improved.

4.3 Curriculum implementation

The EODSS curriculum was established in 2008. Through the development, operation, and perfection of the curriculum for over 10 years, 6 specialties, and 50 classes, an accumulated number of more than 1,600 students have experienced decision-making practice for business operations.

The curriculum is usually opened up during the first term of senior year; teaching should be implemented by class and groups according to the different specialties. Students can autonomously form groups of 5 or 6 members; each group represents an enterprise. A computer network platform is used to construct the EODSS (as seen in Fig. 5) and carry out man–machine counteraction and group counteraction.

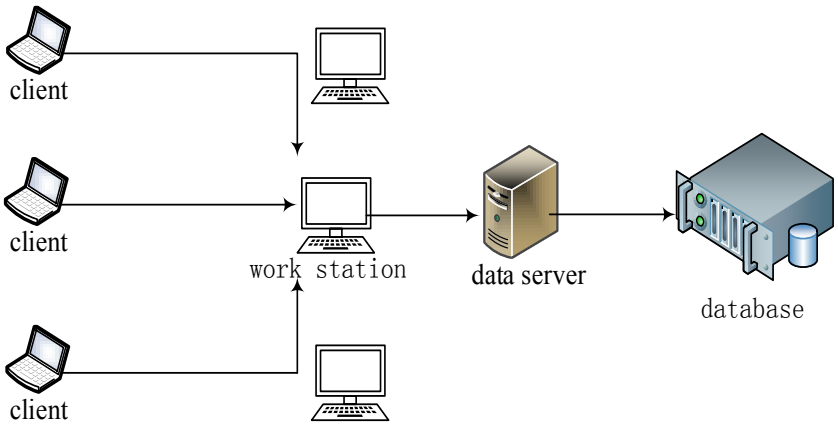
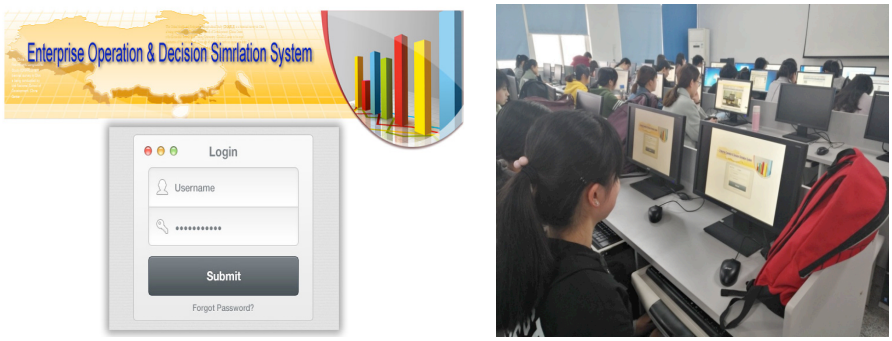


Fig. 5. Construction of EODSS



a) Interface of the system login module b) Computer Operation of Students

Fig. 6.

Curriculum design of the EODSS carries out two competition patterns, namely, man–machine counteraction and group counteraction, and the design of the system login port is as seen in Fig. 6. Each group (word station) represents an enterprise. The group members act as general managers and managers in different functional departments. Each market consists of several enterprises (designed and selected by teachers). Under the same initial conditions, each enterprise starts from enterprise registration and carry out a seven-year competition. The competition data in each phase and the final competition results are processed through the data server and saved in the database. Teachers and group members can adjust the individual settings and view relevant information and enterprise operating performance, as shown in Fig. 6, by logging in the system.

5 Evaluation of Curriculum Implementation Effect under TPACK Framework

This study aimed to perfect the practical curriculum system construction of the economic management specialization and elucidate all types of students' demands for opening of practical curriculums. Thus, before and after each round of teaching in the EODSS, the curriculum group took the teaching content test (full score for single test is 5 scores) to measure the mastery degree of knowledge on enterprise operation and management before and after the practical curriculum. After the completion of the curriculum, random sampling method was used to distribute the questionnaires for determining the degree of satisfaction with the curriculum. A total of 205 questionnaires were distributed. A total of 198 were recovered (96.6% recovery rate). The statistical software SPSS 13.0 was used for the statistical analysis of the results as stated below.

Table 1 shows that after the completion of the practical EODSS curriculum, the students' degrees of mastery of knowledge about enterprise operation and management were higher than those before the teaching cycle. The difference was of statistical significance.

Table 1. Comparison of Mean Scores for students' mastering of knowledge about enterprise operation and management before and after practical curriculum teaching

Test item	Before teaching	After teaching	Difference value	t	P
Enterprise Strategic Management	3.58 + 0.23	4.25 + 0.20	0.67 + 0.31	10.458	0.000
Manufacturing Management	3.78 + 0.21	4.35 + 0.24	0.56 + 0.34	12.473	0.000
Human Resource Management	3.64 + 0.23	4.13 + 0.29	0.48 + 0.37	11.357	0.000
Financial Management	3.72 + 0.18	4.11 + 0.22	0.48 + 0.27	15.437	0.000

Table 2 shows that 98% of the students were satisfied with the curriculum teaching contents. Furthermore, 96% of the students deemed that diversified methodologies that could sufficiently mobilize their learning enthusiasm exist. In the aspect of teaching effects, 97% of the students expressed that teaching effects were favorable and satisfying, 90% expressed their satisfaction with the curriculum assessment, and 93% believed that the curriculum was of prominent significance to improving hands–brain capacities. In general, the TPACK framework had a significant effect on improving the teaching effects.

Table 2. Satisfaction Degrees with Curriculum Teaching

Question	Survey results		
	Satisfied	***Basically satisfied***	***Dissatisfied***
Teaching Content	98%	2%	0
Teaching Methodology	96%	3%	1%
Teaching effect	97%	2%	1%
Testing method	90%	6%	4%

6 Conclusions

On the basis of the theoretical analysis of the TPACK and from the perspective of the "technique–knowledge–methodology" integration, a research on the design and application of the practical curriculum design of the economic management specialization was carried out in this paper, and the conclusions are drawn as follows:

1. TPACK is a new idea for carrying out practical curriculum teaching reform for the economic management specialization. The TPACK theory transforms the focus in teaching from traditional impartment of teaching contents into TPACK, which facilitates the teaching reform and development of the practical curriculum.
2. Curriculum design model under the TPACK framework was proposed. The implementation results of the EODSS curriculum indicate that the curriculum design model under the TPACK framework is operable. Furthermore, the model could improve the classroom teaching effect and contribute to stimulating the learning interests of students and improving their comprehensive application abilities.

On the basis of the integration of modern information technology with the teaching contents and teaching methodologies of the economic management curriculum, the curriculum design model under the TPACK framework was constructed in this study. The research results indicate that this model is highly advanced and practical. This model is expected to be popularized and applied in economic management-related practical curriculum teaching and to undergo continuous development with practice.

7 Acknowledgment

This work was supported in part by the Education Teaching Research Project of Anhui Agricultural University (201537XM86) and the Provincial Quality Engineering Project of Anhui Province (No. 2015zy011, No. 2016jyxm0318).

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9 Authors

Tao Tian (corresponding author) is an associate professor in the College of Economics and Management, Anhui Agricultural University, Hefei 230036, China. (ahtt2009@sohu.com)

Nengfeng Zou is an associate professor in the College of Economics and Management, Anhui Agricultural University, Hefei 230036, China. (NFZ@qq.com).

Jiyu Jiang is a professor in the College of Economics and Management, Anhui Agricultural University, Hefei 230036, China. (2693811360@qq.com)

Xiaochun Xu is an associate professor in the College of Economics and Management, Anhui Agricultural University, Hefei 230036, China. (w98@qq.com)

Article submitted 29 May 2017. Published as resubmitted by the authors 04 July 2017.