Discussion on the Consistency of Undergraduates, Teachers and Society in Professional Education in College of Engineering

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Abstract

In this paper, the consistency of undergraduates, teachers and society were focused on. First, a linear system model was established for the three participants of undergraduates, college (in which the teacher is the main part), and society. With the model, the characteristics of skill and ability enhancement of undergraduates through the college education system were analyzed. Then, the consistencies of undergraduates and society, teachers and society, undergraduates and teachers are discussed in sequence. Combined with specific teaching method applications, the unity of students and teachers is discussed with the society in the process of realization of personal value and creation of social wealth.

Keywords

Higher Education; Engineering; Skill and Ability; Undergraduate; Teacher

Introduction

Guangdong University of Technology, as one of the largest engineering colleges in Guangdong, China, aims to train talents with a solid professional knowledge and adapt to the development of science and technology. As an engineering student, courses of “Principle of Microcomputer and Application”, "Engineering Measurement Technology", and so on are the main fundamental professional courses. We are responsible for the above courses and teach students at different levels such as graduates, undergraduates, students with course elective, and students of adult education. By continuing to explore effective teaching methods and practical training programs, we strive to achieve the goals and expectations for the three of teaching object (students), college (including teachers) and society (including enterprises) in higher education.

Undergraduates, college and society are closely connected [Gu, 2006; Yang and Wang, 2013; Chen et al., 2011; Zou et al., 2011]. In this system, students are moulded doubly by individual internal demands and social expectations, and thus with distinct characteristics of times. College realizes its responsibility by educational structure design and teaching organization, in which the teaching is the most direct and notable activity. The function of college is mostly reflected through the jobs of teachers with preaching, imparting knowledge and solving doubts. The society impacts on the students and the teachers with its scientific-technical progress and its social-moral development status, and meanwhile benefits from the fresh blood of educated graduates and scientific fruits of teachers. The above three form an organic whole with contradiction [Gu, 2006; Yang and Wang, 2013] and consistency. This paper mainly discusses the consistency of undergraduates, teachers and society.

Relationship among Students, Teachers and Society in Professional Education

Engineering colleges mainly provide professional education for specific areas and train talented people with specialized skill for society. Society provides a survival environment and self-realization platforms for undergraduates and teachers. Undergraduates and teachers live in the society, and meanwhile promote social
development. The relationship of the above three can be illustrated in Fig.1 and they are united in the development of mutual shaping, mutual demand, and mutual promotion.

The relationship can be described with a linear system as follows:

\[ W(t) = E(S(t)) = S(t) * e(t) = \int_{-\infty}^{\infty} S(\tau) e(t-\tau) d\tau, \]  

where, \( S(t) \) is the input characteristics of students with initial skills, \( E(\cdot) \) is the effect of college education system on students, \( e(t) \) is the comprehensive properties of college education system, the operator \( \cdot * \cdot \) represents convolution, \( W(t) \) is the output characteristics of skilled students after college education, \( t \) is time which often equals to 4 years. In this system, the students are undergraduates.

With a Laplace transform, we can get the skill enhancement amplitude ratio of college education system \( A(s) \), which can be expressed as,

\[ A(s) = A_0 s^s A(s), \]  

where, \( s \) represents the individual characteristics of different students; \( A_0 \) is the sensitivity of the college education system ( i.e. skill enhancement constant) and \( A(s) \) is the skill enhancement amplitude ratio of different adaptive characteristics of students. Education system in different colleges has different skill enhancement constant. If \( A_0 < 1 \), the education system is not sufficient; while \( A_0 = 1 \), the education system just meets the requirements; and \( A_0 > 1 \), the education system achieves the enhancement.

If the college education system is insufficient, skill enhancements of most students are also not enough. If the comprehensive characteristics of college education system in different schools are different, the ability of skill enhancement is also different. Students with different interest and different diligence will obtain skill enhancement in different scale through the same system. Furthermore, the system and the participants are not independent, which are influenced by the social development in changing the structure characteristics of college education system and individual characteristics of students as shown in Fig.1. The effect of society is enhanced successively to the student input state, structure characteristics of college education system, and the student output state. Among them, the effect of college is mostly undertaken by teachers with their teaching and guiding.

\[ \text{e(t) college} \]  
\[ \text{s(t) students} \]  
\[ \text{w(t) skilled students} \]  
\[ \text{teachers} \]  
\[ \text{society} \]  

**FIGURE 1. RELATIONSHIP AMONG STUDENTS, TEACHERS AND SOCIETY.**

**The Consistency of Undergraduates and Society**

Undergraduates have high expectations and requirements for education. They look forward to grasping the knowledge and technology to serve the society and realize personal value through higher education. The rapid development and fierce competition of modern society has the urgent need for undergraduates with certain skills to walk directly onto the platform provided by the society, to promote "motor vehicle" of each fields to develop smoothly, orderly, and acceleratedly. While the undergraduates also hope that they can find what they use in work being just what they learned in college, and obtain the social recognition and support. Therefore, undergraduates' expectations and social demand are fundamentally consistent.

This consistency promotes current undergraduates not only to learn basic knowledge and technology in college, but also to devote more to skill training and practice. As in our school, undergraduates participate to various skill-training activities as follows:
many kinds of training activities and special module activities in college such as Robot Team, Formula One Team, and so on;

many levels of challenging and innovative competitions such as Challenge Cup, Undergraduate Mechanical and Electronic Product Innovational Design Contest, and so on;

"3+1" joint training between school and enterprise such as in Mattel Electronics Dongguan, China Southern Airlines Company Limited, and so on.

Undergraduates convert knowledge and technology into individual skills through learning in class and practice after class, and further into personal abilities through social communication. The social system provides students many kinds of opportunities and platforms through school and enterprises. The undergraduates and the society achieve consistency in demand and development.

The Consistency of Teachers and Society

There always have been very high demands and expectations for teachers by society. The society hopes that the higher education system can produce useful talents with higher level and higher quality. Also hope that the talents are available, useful, and easy to use. This is consistent with the need of teachers. Teachers sincerely hope that through their teaching and cultivating, undergraduates can meet with this requirement.

Teachers in colleges have the responsibility for professional education. Professional education is closely connected with the social development of science and technology. The social development depends on the development of science and technology. And the development of science and technology updates the existing knowledge. Though the main content of professional education still depends on the accumulation of knowledge over the last hundred years, it has integrated of new technologies and new knowledge through the update of teaching materials and the learning of teachers.

Teachers need to learn and apply the latest teaching philosophy and teaching methods such as the PEACH teaching ideas [Chen et al., 2011], and constantly add new knowledge in class. In our practice, in the course of Principle of Microcomputer and Application, we add the comparison of MCS51 8-bit single chip microcomputer with 32-bit personal computer, and the knowledge of bio-computer and photon computer. College teacher has the internal impetus to bring forth the new through the old and improve teaching quality. At the same time as part of a commitment to scientific research system, there is a continuous requirement for college teacher to learn new knowledge and train new skills.

The value of teachers in college of engineering lies not in how many undergraduates and how many classes they teach, but in how many professional talents they train to meet the need of social development. The value of the society for education (i.e. teachers) also focuses on the quality of graduates delivered to the society. Teachers and the society are united in providing how many skilled graduates.

The Consistency of Teachers and Undergraduates

All activities of professional education in colleges of engineering are to cultivate undergraduates to master skills, to design tools, and to build system with the aim to extend the ability of humankind and further replace humankind to work. Therefore, almost all of the professional knowledge can be connected directly with thinking and behavior characteristic of human [Zou et al., 2011]. Only teachers can feel about this point and put its embodiment in the teaching process. Undergraduates are in growing, easy to be influenced by the society, and with distinct characteristics of the times. From such aspects that guiding students to promote their advantages, overcome their disadvantages, and develop their potentiality, teachers and undergraduates are a pair of contradictory body [Gu, 2006; Yang and Wang, 2013]. But considered that undergraduates, teachers and society being interdependent and needing each other, they have consistency. Teachers hope to enable undergraduates to master professional knowledge and professional skills, and students hope to construct the basic practical ability and the ability to solve problems to work in enterprises or carry out scientific research in research units. The two kinds of hope are highly
consistent.

As a practice, we carried out the following work in the course of the Principle of Microcomputer and Application as:

- grouping to learn, discuss and organize: every five students into a group to answer questions in class, discuss on homework after class;
- grasping a simulation tool to understand all the content in the course: introduce a KeilC51 microcontroller software development system to do homework, to design and debug procedures, and to understand RAM and ROM, interrupt system, Timer/Counter, etc.

And as a feedback, undergraduates asked questions freely at any time in the class; argued about the problem of multi-level interrupt nesting which was self-studied content; carried out the group discussion actively after class and selected crew to answer in class.

Undergraduates devote actively into learning and practicing, and teachers devote carefully into the curriculum teaching. They work together leading to a virtuous effect in the education system. Thus students enhance their professional skills and abilities as shown in Fig.1.

Discussions

Undergraduates and teachers keep consistence with society in the process of realization of personal value and creation of social wealth. With the enhancement through college education system, students improve their knowledge structure, enhance their independent learning and practical ability, obtain social acceptance, and realize their value. Teachers improve the characteristics of college education system by renewing knowledge structure and level, cultivate students to have a solid foundation of professional knowledge and skill, obtain social acceptance, and realize personal value. The society provides working platform and development space for students and teachers and promotes students’ and teachers’ efforts and expectations to coordinate social demand. In the system, undergraduates are like creative and active seeds; teachers are like gardeners; the society is like a garden with good environment and facilities; the three supplement each other, and jointly create a flowers-blooming and colorful garden.

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REFERENCES

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