Value Analysis and Mode Construction of Tutorial System for P2P Undergraduates in Computer Science---Based on the Reform Practice of Tutorial System in the College of Computer Science, Xi’an University of Technology

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Abstract. With the implementation of credit system, undergraduate tutorial system is becoming a new system of student education management in colleges and universities. The implementation of tutorial system of undergraduate students is based on educational theories, such as teachers teaching to educate people, teaching students in accordance of their aptitudes, and constructing a harmonious teacher-students’ relationship. This paper puts forward a feasible operation mode for the optimization of the tutorial system for undergraduate students, which has achieved good results.

1. Introduction
Students are the main body of colleges and universities and the object of education. These are urgent problems to be solved in the current system and mode of higher education, how can colleges and universities truly implement the educational concept of “student-oriented”, how can they cultivate more outstanding talents, and how they make more students feel the care of teachers’ love in school, and benefit from various aspects in school education, and how to construct a more harmonious campus environment. On the basis of the complete credit system and the reform of tutorial system, our university, as the trial basis in the College of Computer Science, innovates the talent training and education management system, and makes a bold exploration and experiment on the education training mode.

Universities are the “brains” of society, and have charge of the responsibility of cultivating high-quality talents. However, it is an indisputable fact that the quality of undergraduate students has generally declined after large-scale enrollment expansion. Millions of young people are fortunate to enjoy higher education every year, in fact, the shortage of resources in colleges and universities has given birth to a mode of “mass production”. The disadvantages of this mode of “mass production” are concentrated in the fact that the emphasis is placed on management over education, knowledge over morality, lack of individualized guidance and delicate cultivation for students. After graduation, the knowledge structure and the personality accomplishment are difficult to adapt to the social demands, and that makes this social difficult problem indirectly increase the employment tension of university students. With the deterioration of the employment situation brought by the financial crisis, the drawbacks of this mode of training have become more and more obvious.

Throughout the educational history of human, the truly successful education is moral and intellectual compatibility, and the combination of teaching and learning, which is the inexhaustible source of inspiration of contemporary higher education workers. As early as 2,500 years ago, Confucius, a great educator in ancient China, founded the private school to accept and teach students, and trained talents by the “tutorial system”. The educational concept of “teaching students according to their aptitude”, the teaching method of “discussing as equal, following good guidance”, the teaching process of “combining study with research, emphasizing practice”, the educational goal of “facing life, teaching people to be human beings”, the teacher-student relationship of “feeling like father and son” and so on, they are worth thinking about and inheriting. In the history of modern higher education, the
undergraduate tutorial system was first applied to the universities of Cambridge and Oxford in the 14th century and achieved great success, and the teaching mode of “cooperation and discussion”, the educational concept of “moral and intellectual integration” and the warm family-style teaching atmosphere, which and became the secret to training talents, created by them to enable to cultivate great masters and leaders who are like stars from generation to generation, more than 160 Nobel laureates alone. From now on, we are familiar with the well-known universities in Europe and the United States, which regards undergraduate tutorial system as the basic system design of school teaching and educating.

In recent years, the tutorial system for undergraduate students has arisen in the field of higher education in China, to a certain extent, in order to make up for the deviation of this “mass production” educational model, it is also a beneficial attempt to realize the individuation education as far as possible under the present condition of higher education. Taking our school as an example, we began to implement the “complete credit system” in 2004, and the implementation of the class tutorial system. However, with the increasing pressure of teachers on teaching and research, the role of class in undergraduate teaching has gradually weakened, and the original undergraduate tutorial system is not able to undertake the tasks of higher education. In this way, the effect of education is greatly reduced. Although in recent years, we have made great efforts and intensified our exploration in various aspects, we have not been able to get rid of the basic educational framework in general, which is essentially the “class teacher system” in middle schools, and the tutorial system is often a mere formality. After years of practice and exploration, our college of computer science has carried out an effective reform of the class tutorial system.

2. The Educational Theoretical Basis and Value Analysis of Implementing the Reform of Tutorial System for Undergraduates

2.1. The Tutorial System is an Effective System to Realize the Organic Combination of Teaching and Educating, and to Play the Leading Role of Teachers and the Main Body of Students

Teaching and educating is our own job, but it is an ideal condition that we pursue in modern higher education, and it is difficult to carry out the education for all. The implementation of tutorial system for undergraduate students is able to not only display the leading role of teachers in the process of education and teaching, but also embody the main position of students in this process, and realize the organic combination of “teaching” and “education” from the system level. Colleges and universities have regulated all aspects of teachers’ teaching in a mature system for a long time, but how to bring all teachers’ educational function into full play from the system has always been a difficult problem in the educational management of students in colleges and universities, and lack of effective institutional mechanisms. Although students can be educated through class teaching, the main task of class teaching is to impart knowledge after all, it is difficult to assess and evaluate the educational responsibility of teachers. Implementing the tutorial system for undergraduate students and making the duty of teachers to guide students systematized, the objectives clear and the objects concrete, and combining it with scientific and feasible examination methods, can achieve the organic combination of “teaching” and “education” from the system, and change the phenomenon that teachers are unable to educate people in the process of teaching and learning, and make every teacher take on the responsibility of educating people, which changes from the general guidance to the individual guidance, and enhance the sense of responsibility of teachers to lead by example, also reflects the concept of teaching management of “people-oriented”, “student-centered”.

2.2. Tutorial System is an Urgent Need to Carry out the Principle of Teaching Students According to Their Aptitude and Pay Attention to the Individual Differences of Students

Teaching students in accordance with their aptitude is a universally recognized principle of education and teaching. Education of specialized subjects is the basic task of higher education, which is able to lay a professional foundation for the future development of students, which is a basic standard requirement in the cultivation of undergraduate students and a necessary condition to guarantee the quality of talent cultivation in colleges and universities. But at the same time, we are supposed to
follow the precepts of talent growth and success, and grasp the individual basic conditions, endowments and interests of each student. Therefore, in the process of training students, we are supposed to implement the tutorial system for undergraduate students, and set up the concept that everyone can become a talented person in a variety of ways. In accordance with their actual conditions, we guide the students focus on individual differences, and cultivate talents regardless of one pattern, and the principle of teaching students in accordance with their aptitude should be embodied in every liberal education, what the liberal education should be.

2.3. Tutorial System is the Basic Way to Improve the Quality of Student Training

Students are “teacher-oriented”, like sunflower flowers have been following the direction of the sun, therefore, a good teacher-student relationship is the basis and premise of teacher-student guidance. Since the beginning of Confucius’s teaching 2,500 years ago, China has formed a good teacher-student relationship. Up to now, the educational circle has also attached great importance to the important role of the teacher-student relationships of talents’ development, so it indicates that the system of face-to-face direct and guidance still has its important value at present. At present, the relationship between teachers and students in colleges and universities is indifferent or even antagonistic, and it is common for teachers and students to lack spiritual communication in the classroom. However, compared with the academic year system, the elective courses system under the credit system makes students have more autonomy in choosing courses and even professional direction. In the process of practice, it is necessary to cooperate with both teaching and learning: For the freshmen who have just entered the university, they urgently need the guidance and help of teachers, the tutorial system for undergraduate students is the system that colleges and universities require professional teachers to take charge of the study, research and development direction of a certain number of undergraduate students, which reflects mainly the real care, love and help for students. The tutorial system of undergraduate students is also helpful for teachers to understand students deeply and to establish a more equal, free, friendly, harmonious and relatively fixed relationship between teachers and students, which can greatly improve the quality of talent cultivation in our country.

3. Construction of Operating Mode of P2P Undergraduate Tutorial System

The tutorial system for undergraduate students in colleges and universities is designed as a system to explore new ways of teaching and educating people in colleges and universities. However, due to the increasing pressure on teachers in scientific research and teaching, in particular, the implementation of the “complete credit system” makes the role of class units in teaching gradually weakened, class tutors have been unable to shoulder the new tasks facing higher education in the class tutorial system currently implemented in colleges and universities. In view of these problems, the project team believes that it is an important link to realize the innovation of the training model to study the role of undergraduate tutors in educating students under the credit system and to construct an effective model of undergraduate tutor system, and it is also a system design to explore the work of university teaching and educating. In order to strengthen the work of the undergraduate tutor in shaping the scientific outlook on life, cultivating the professional quality, guiding the employment or further study and so on, and the credit system for the deepening reform and the training of outstanding personnels is of great practical significance. At the point of these problems, through more than ten years of exploration and practice, the college of computer science in our university, from two angles of “teaching” and “learning”, construct a P2P (Point-to-Point) undergraduate tutor system which is more suitable for personalized education.

3.1. Selection and Appointment of Undergraduate Tutor

According to the different characteristics of the current teacher-student ratio, the different school districts, the basic courses for freshman and sophomore, and the specialized courses for junior and senior, the college provides class tutors for the basic courses for freshman and sophomore undergraduates, who are open selection of appointments in the whole school and offer letters of appointment; junior and senior undergraduates for every 3-6 students with one tutor, which uses the two-way choice between tutors and students, supplemented by college deployment. The specific
measures are as follows: teachers’ conferences are held by various departments, and teachers themselves are arranged to introduce their research direction and lecture courses to students by various online and offline ways. Students are able to choose tutors according to their professional orientations, interests and actual situation. Tutors are able to choose students according to their own requirements, and the college determines uniform deployment. The number of students per instructor for each grade matches the number of students per instructor for each grade and should not be exceeded. The number of students under specific guidance is determined by the number of teachers in each department. The number of students in each grade should be 5,4and 3 students under the guidance of professors, associate professors and lecturers. Once teachers and students have been identified, the implementation of responsibility is consistent system, from daily management and academic guidance to graduation design guidance, employment or study. In case of special circumstances, the student or tutor may make a request at the end of each semester and be replaced by the college according to the procedure. On the basis of the arrangement of tutors, freshman and sophomore hires the old professors of the school’s Customs and Engineering Committee to be the second tutors of the students, who are responsible for helping the college to complete the students’ formative education. In the junior and senior, the person in charge of the enterprise or the engineer will be the student’s professional tutor or the second tutor, which is responsible for training the students’ ability to adapt to the enterprise and society.

3.2. Responsibilities and Requirements of Undergraduate Tutors
As the “resources” of higher education institutions, teachers have the scarcity of economic concept, and as the beneficiaries of this scarce resources, students have the infinity of demand. Therefore, we must determine the work content of the undergraduate tutor, that is, “what to guide, what not to guide.” Generally speaking, the tutor is supposed to be a kind of overall guidance to the students, including ideological education, professional study, employment and entrepreneurship, ability and quality, physical and mental health. According to the characteristics of different grades, the work content of the freshman and sophomore of the university is mainly ideological guidance, including the teaching of truth-seeking, goodness-seeking and realness-seeking, adaptive education, such as the characteristics of university study and life, and the research contents, direction and development frontier of students’ discipline and specialty. At this time, it is necessary to combine the abilities and interests of the students, and to pay attention to the integrity of the knowledge structure. The junior and senior of the university mainly focus on the training of basic scientific research content, and guide students to select courses, social survey, employment and entrepreneurship and so on. The tutor can arrange students to participate in the tutor’s project research or various science and technology competitions, and cultivate students to complete each link of scientific research independently, so that students can be trained in scientific research practice with strict systematic skills and scientific literacy, at the same time encourage and guide students to participate in a variety of academic seminars and production practice, expand students’ horizons, activate students’ innovative thinking.

3.3. Appointment and Assessment of Undergraduate Tutors
The implementation of undergraduate tutorial system must be supplemented by a scientific appointment and assessment system. The college has set up a leading group on the appointment and assessment of tutors, which is held once every academic year, and failure in assessment during the appointment period may result in termination of appointment, and the results are reviewed and filed with the Student Affairs Section. In the assessment of the tutor, the assessment contents include student evaluation, the condition of responsibility completion, school routine completion, in-depth students class and class and study of style, as well as the assessment indicators to measure student learning: such as pass rate of Public Level Four, attendance rate, pass rate of postgraduate examination, the rate of student discipline violation, rate of excellent performance, fail rate of examination, the rate of employment, and the participation rate of scientific and technological activities and so on. The university focuses on the assessment of the instructor’s work process, such as student evaluation, work statements and other process assessment indicators accounted for 80%, and assessment results as the annual assessment of the teacher’s work, job title evaluation and appointment of the basic conditions.
In addition, on the basis of the assessment, the college also sets up a special fund to establish an effective incentive and guarantee mechanism.

3.4. Requirements for Students in the Reform of Tutorial System
When choosing a tutor, students should master the research direction and content of the tutor as accurately as possible, and select the tutor according to their own interests and wishes. Students are supposed to be studious and self-motivated, to study, thinking. If meeting encountered difficulties and problems in daily life, then can seek the greatest guidance and help from a tutor. The student must meet with the tutor within one week after the beginning of each semester. According to the tutor’s opinion and the individual’s actual situation, the student must decide the study plan of this semester. Students are supposed to take the initiative to participate in the instructor’s guidance, training process and academic activities of the subject group. Especially in the process of scientific research, students are supposed to seek truth from facts, work hard, think hard and ask lots of questions, and strive to improve their ability and level of scientific and technological innovation.

3.5. Development of an All-round, Diversified and Interactive Platform for Student Education Management System
Any reform is a system engineering, which necessarily requires a combination of ideas, institutions, and the tools to implement them in order to produce benefits and improve efficiency. Therefore, in correspondence with the reform of the tutorial system, we have worked hard on the organizational form of student education management, the interactive platform software for tutor, instructor, student and parent—Information-based student management application system. The development and trial operation of the information-based student management application system support the information-based technical method in the reform of tutorial system, in order to meet the demand of multi-value trend. The system is based on SOA (Service-Oriented Architecture, as shown in Figure 1) student management system, using Architecture of Spring + structs + ibatis, and a hierarchical design approach (including persistence layer, business layer, domain control layer, integration layer, presentation layer, as shown in Figure 2.), building all kinds of student-managed atomic service libraries in a low-coupling way, and achieving complete student-managed services through service assembly and supporting heterogeneous computing environments, which can be easily integrated with other information systems(such as integration with the credit system management system). According to the characteristics of Student Education Management Service, this information organization system consists of four parts, including power system, control system, emergency system and value system, Respectively corresponding to the style of study, day-to-day management, security and stability, ideological and political education four parts, which makes the information organization and the existing tutor management system integrate each other, and realize the innovation of education management tools under the network environment.
The dynamic system reflects a person’s basic desire to belong to a particular organization, provides the members of the organization with the basic motivation to transform from a free state to an
organizational state, and establishes organizational identity mechanism for students by establishing a self-organizing interaction system through students and tutors. Its direct aim is to stimulate students’ enthusiasm for self-improvement through a new organizational identity mechanism, and strengthen learning motivation, and build a learning organization. The ultimate aim is to strengthen the organization’s inclusiveness and expand its mass base, to meet the multi-level and diversified value requirements of students. In addition, the self-organization behaviors of students will be integrated into the existing organizational system.

The main role of the control system is to improve the day-to-day education and management of students as information technology a means, so that tutors can complete the daily work in more, faster, better and cheaper ways, and can carry out various kinds of retrieval and analysis of students’ basic information. Basically, it can realize the informatization and networking of students’ work, and improve the efficiency and quality of daily work, at the same time establish the informatization process control system. How to manage the dynamic group of students with curriculum as the center under the credit system will be solved by this system. Its direct aim is to improve the service level of the university, while the ultimate aim is to integrate all students and parents into the organization, and to improve the control of the organization by using information technology to extend the tentacles of the organization.

The main function of the emergency system is to improve the school’s ability to deal with all kinds of emergencies, to improve the efficiency of information dissemination and to improve the speed of response, also establishes a multi-dimensional emergency organization composed of tutors, class cadres, party members and parents, so that to improve the school’s ability to deal with large-scale mass incidents. Its direct aim is to improve the schools’ ability to deal with public emergencies, and to solve problems with the fastest speed and the strongest organizational strength, while the ultimate aim is to prevent the spread of various emergencies to ensure the stability of the entire community.

The core of value system is the problems of ideology, which constructs a political communication tool in accordance with the characteristics of students is with making full use of the existing information resources based on information technology. For example, based on the campus network, personalized information dissemination system is constructed directly for each student’s. Using the mainstreamed network community, such as various online societies, associations, will lead the values of college students to the same direction, and take the initiative to occupy the new media channels, at the same time establish mainstreamed information dissemination channels which realizes the network-based ideological and political education. Its direct purpose is to provide students with personalized information dissemination tools so that can transmit information to each student easily and timely, while the ultimate aim is to establish a kind of political communication tool with strong practical value, and can make students have strong dependence, which accomplishes the ideological guidance in the unconscious.

This kind of information-based organization is a positive measure for universities to adapt to the changes of the external environment. This organization constructs an all-round, diversified and interactive platform of student management and ideological and political education system under the network environment, which becomes an effective way of ideological and political education and student management under the new situation. It expands the organization’s mass base by the method of diverse organizational identity, and reshapess the organization’s power structure by the method of optimizing the organization’s service ability, and enhances the control ability of the organization by the method of extending the organization’s tentacles, and strengthens the ability of ideological competitive by the method of Innovation Organization dissemination channel, which is the necessary methods of the guarantees to university daily work smoothly in the social transformation time and campus stability with the strong practical value and the perspectiveness.

4. Remarkable Results of the Reform of Tutorial System for Undergraduate Students
Practice has proved that the new tutorial system is a good method to further strengthen the relationship between teachers and students, to implement the subjective education and to improve the comprehensive quality of graduates, as well as a training ground to optimize the construction of teachers and cultivate the backbone of education. Since the implementation of the reform of the
undergraduate tutorial system, the college has made great progress in all aspects of talent cultivation under the mode of full staff education.

4.1. The Reform of Tutorial System has Brought about Significant Changes in Students’ Learning Attitudes and Effects
Through the reform of the tutorial system, the students are able to devote their time and energy to their study and make obvious progress in the construction of learning style under the fine cultivation and personalized guidance of the tutor. The new tutorial system stimulates the enthusiasm and responsibility of all undergraduate tutors to teach. Since the implementation of the reform of the tutorial system, the undergraduate tutors with research projects have included their students in their own research projects more or less. At present, more than 50% of the students have been included in the research projects of the tutors. Students’ practical ability is rapidly improved and their self-consciousness of learning is greatly improved through participating in scientific research training.

4.2. The Reform of Tutorial System Contributes to Easing the Employment Pressure of Undergraduates
Due to all the undergraduate tutors’ hard work in College of Computer Science, a lot of graduates’ employment concept have the rational change, and establish of a reasonable expectations. At the same time, graduates’ employment pressures have been made ease through actively contacts with the employment, invitations to many strong specialized enterprises such as Neusoft, Emerson, Navionics, Fujitsu, Digital China, YGSOFT, the SYBASE Xi’an Branch of America, Software Technology Engineering Research Center in Xi’an and so on, especially lectures and guidance of professional tutors make the college students’ view of employment situation have the correct analysis and judgement to employment situation, expectations, and job outlook aspects. The rate of actual employment in the College of Computer Science has been above 90% for many years.

4.3. The Reform of Tutorial System has Strengthened Teachers’ Professional Level and Sense of Responsibility
By strengthening two-way interaction, the reform of the tutorial system enables tutors to better understand the needs of students, which plays a great positive role in promoting the teaching effectiveness. By encouraging teaching benefits teachers as well as students, the reform of the tutorial system not only enables students to get exquisite training, but also enables undergraduate tutors to enhance their professional level, sense of responsibility, and sense of mission, which more and more teachers make the work of education to the first leading position. By advocating subtle influence, problems among students are easy to be detected by teachers, and most security risks can be found and dealt with in the bud in a harmonious teacher-student relationship.

4.4. The Reform of Tutorial System has Strengthened the Cohesion and Centripetal Force among Teachers and Students
“Students don’t have to be inferior to teachers, and teachers don’t have to be superior to students.”, the new undergraduate tutorial system breaks the rigid boundary between teachers and between teachers and students in terms of professional titles and status. It infuses fresh elements into the old concept of rigid and demanding respect for “elders are superior to youth”, and changes the constitution of the body, and promotes harmonious development. In the process of tutoring undergraduate students’ study and life, both old professors and young lecturers have a common goal and a common topic. They can exchange guidance experience and discuss with each other, which naturally expands to mutual understanding and intimacy. The relationship between students and teachers forms a good teacher and helpful friend, and even they compete together in some activities with happiness knowing no bounds. Because of the common goal, everyone thinks about the same problem and works towards the same direction, and the cohesion and centripetal force between teachers and between teachers and students have been strengthened. In addition, such barrier-free communication is also conducive to the adjustment of guidance strategies at any time. The optimization of teacher-student relationship can bring the effect of teaching and learning into full play to the extreme, and students have completed
their own good transformation in the long-term contact with the tutors.

4.5. Cultivating a Group of Solid Knowledge, Firm Faith of Professional Teachers

“The wind sneaking into the night, smooth things silent”, during the more than 10 years of the college to carry out the reform of the tutorial system, a professional quality, a team of many strong excellent mentors, and strong faith of education informs, which many excellent teachers stand out. They learn the high body, and take the lead in setting a good example, rigorous attitude, scientific research methods and lofty life goals will instill to students’ thoughts in the daily work and routine guidance, so that the academic performance and spiritual outlook of college undergraduates have had a qualitative change. We can often see some tutors with important positions always being around the figure of undergraduates, some tutors also does not forget to eat dumplings with their own students that always stays in university at the Chinese New Year’s Eve, some tutors who holds the infants, stick to a weekly extracurricular counselling skills courses, some tutors always accompany beside and encourage students, and pay of medical expenses for the students who was ill in the hospital and so on. They treat their students as their own children or siblings, which plays a good demonstration effect.

According to the experience of the implementation of the undergraduate tutorial system in the College of Computer Science, there is a positive interaction between the advantages of the credit system and the construction of the effective mode of the undergraduate tutorial system. Adhering to and improving the undergraduate tutorial system constantly, and exploring an implementation mode of the undergraduate tutorial system earnestly with the conforming actual situation of China’s higher education, are able to solve many deep and fundamental problems in China’s higher education.

5. References

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