

Research and Practice on Sustainable Development of College-enterprise Cooperation in Applied University*

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Abstract—The deep cooperation between college and enterprises is the only way for the transformation, survival and development of applied universities, and also a shortcut for the construction of new engineering speciality. However, because the college-enterprise cooperation involves many stakeholders, such as government, college, enterprises, students, etc., the process of college-enterprise cooperation must consider the interests of all cooperators. In the long-term process of college-enterprise cooperation, the college needs to break through not only the system, but also the renewal of ideas, more the innovation of management. This paper mainly studies the key factors affecting the sustainable development of college-enterprise cooperation, and summarizes the "four essentials" and "four neglects" of the key factors in the practice of college-enterprise cooperation for more than ten years, and combs and summarizes the college-enterprise cooperation mode of the author's university, which can provide some reference and inspiration for other universities.

Keywords—college-enterprise cooperation; sustainable development; key factors; quality evaluation of talents training

I. INTRODUCTION

The college-enterprise cooperation is the inherent need of university transformation, survival and development. It is also an effective way to cultivate high-quality applied talents. It is an important carrier of deepening cooperation education in CEEUSRO, and an important mode to improve the quality

of talent training. At present, the scholars at home and abroad have done a lot of research work on college-enterprise cooperation, and achieved many research results [1], [2], [3], [4].

However, because the college-enterprise cooperation involves many stakeholders, such as government, university, enterprises, students, etc., the process of college-enterprise cooperation must take into account the interests of all cooperating parties. The premise of realizing college-enterprise deep integration is to form a virtuous circle and sustainable development of college-enterprise cooperation talent training mode and operation mechanism. Only by realizing "mutual benefit and win-win cooperation" can college-enterprise cooperation be realized to sustainable and stable development [5], [6], [7], [8].

This paper mainly studies the key factors affecting the sustainable development of college-enterprise cooperation, and summarizes the "four essentials" and "four neglects" of the key factors in the practice of college-enterprise cooperation for more than ten years, and combs and summarizes the college-enterprise cooperation mode of the author's university, which can provide some reference and inspiration for other universities.

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II. "FOUR ESSENTIALS" AND "FOUR NEGLECTS" OF KEY FACTORS FOR SUSTAINABLE DEVELOPMENT OF COLLEGE-ENTERPRISE COOPERATION

A. "Four Essentials" of Key Factors for Sustainable Development of College-enterprise Cooperation

1) *To gradually increase the strength, depth and breadth of college-enterprise cooperation:* In fact, the primary factor affecting the sustainable and healthy development of college-enterprise cooperation is the strength, depth and breadth of cooperation between the two sides. Under the background of deep integration between college and enterprise, if the "two main bodies" of college and enterprise invest a lot of manpower and material costs in their cooperation, they have signed a long-term strategic cooperation agreement, which stipulates in detail the interests and cooperation modes of the cooperation subjects, including training mode, teacher training, curriculum system, professional co-construction, internship recommendation, employment guarantee, cooperative research and teaching and the development of academic resources and so on, and gradually formed management rules and regulations and implementation programs in the implementation. In this way, after many rounds of talent training, the two sides will gradually merge into a community of interests. With the accumulation of input from both sides, the goals of both sides will be more consistent. For example, the deep college-enterprise cooperation model of the author's university, from the initial "shallow cooperation" model to the current "deep cooperation" model, is also formed in the process of continuous exploration and practice.

2) *To realize the docking of teaching standards and vocational entry standards in cooperation:* According to the occupational standard system of our country, the occupational ability required by a skilled post is taken as the standard, which reflects the corresponding knowledge, ability and quality requirements of a post. The formulation of teaching standards in higher education is often based on vocational standards, but higher than vocational standards. It pays more attention to the cultivation of students' general ability and professional core competence [2], [3], [4]. In fact, the introduction of professional standards is often neglected in the formulation of professional training programs, which leads to the derailment of talent training and market demand in many universities. In the process of deep cooperation between college and enterprise, the formulation of talent cultivation plan must be based on sufficient talent market research, construct knowledge, ability and quality matrix according to the needs of post groups, and then transform it into corresponding curriculum system, so as to realize seamless connection between teaching standards and vocational standards, which is also one of the core elements of sustainable development of college-enterprise cooperation.

3) *To form a complete "double-subject" teaching quality monitoring system for college and enterprise:* Under the premise of carrying out college-enterprise collaborative education, the college should pay attention to the role of "double-subject" teaching quality monitoring. It is necessary to break the traditional teaching quality monitoring methods and means and integrate them into the assessment methods and competency evaluation standards of prospective employees. Meanwhile, in the process of teaching, the cooperative enterprises should appoint experienced front-line engineers or project managers to serve as training guidance. Teachers are responsible for teaching tasks with strong practical applicability. In the process of assessment and evaluation, they adopt a procedural assessment system, focusing on assessment ability and comprehensive quality. At the same time, in order to better play the role of "dual-subject", both college and enterprise should test students' professional competence every semester, monitor and feedback the teaching quality, and improve the "dual-subject" teaching quality monitoring system is an important guarantee for the healthy and sustainable development of college-enterprise cooperation.

4) *To construct the quality evaluation system of personnel training based on obe concept:* Against the background of college-enterprise cooperation, the evaluation of training quality of applied talents is a multi-level, non-linear, dynamic and fuzzy complex system. It can reasonably and accurately evaluate the effect of college-enterprise cooperation. It can provide an important basis for decision-making of teaching quality management, optimization of specialty setting, formulation of training scheme, innovation of curriculum content and design of cooperation system. It is also the continuity of college-enterprise cooperation. The first element of healthy development and the OBE achievement-oriented concept can be used as the concept guidance of talent training quality evaluation. The "OBE talent training quality evaluation index system" constructed by the author's university includes: target level A: college-enterprise cooperation talent training quality. The criterion level B includes: the basis of college-enterprise cooperation; the process management of college-enterprise cooperation in educating people; the effect of college-enterprise cooperation; and the comprehensive quality of students. Measure layer C includes specific implementation measures and ways. In the process of evaluation implementation, we can adopt the combination of quantitative and qualitative, extensive investigation and random sampling, university evaluation and enterprise evaluation.

B. "Four Neglects" of Key Factors for Sustainable Development of College-enterprise Cooperation

1) The interests of either side of the university or enterprise should not be challenged: In the process of cooperation, the two sides must put themselves in a right position, in line with the cooperative policy of "equality, mutual benefit and win-win cooperation", in order to form a sustained and healthy development trend, otherwise, any party challenging the interests of the other side will be counterproductive, or even "split up". For example, the interests of universities are often embodied in the quality of talent training and obtain employment, the establishment of professional brands, professional co-construction in the process of cooperation, the training of teachers, etc., while the interests of enterprises are often economic interests, talent reserves, social benefits and support from national policies. The interests of both sides are sometimes consistent, and sometimes contradictory. Therefore, in the process of cooperation between the two sides, we must find a suitable balance point in order to achieve the coexistence of interests.

2) The cultivation of "Dual-ability" teachers should not be neglected: The "Dual-ability" teacher is a key factor to ensure the quality of applied talents training. Under the platform of deep cooperation between university and enterprise, we should not ignore the training of this teaching team, but focus on taking various measures to strengthen the training so as to prevent the disconnection between the teaching content of university and the training content of enterprises. The author's university experienced the initial process of "running-in" between university and enterprise. Because the original teacher team lacked the experience of enterprise project development, its teaching content and teaching method were far from the content of enterprise training. During the later period of student training, some basic professional knowledge needed to be taught repeatedly, which affected the process and effect of project training. After thorough discussion and communication, the two sides have taken various measures to strengthen the training of the "dual-ability" teacher team. The most effective measure is that young and middle-aged teachers under 50 years old in the college are selected and sent to the front-line of the enterprise for 0.5-1 semester of post-training, and are evaluated strictly according to the employee evaluation system of the enterprise. The evaluation results are regarded as the first choice, performance evaluation and professional title of the college. The important basis for evaluation is that after 3-5 years of intensive training, the proportion of "dual-ability" teachers has reached 70%, which effectively improves the quality of talent training in college-enterprise cooperation, and provides an important guarantee for the sustainable and healthy development of college-enterprise cooperation.

3) The supervisory and guiding role of the main body of the university teaching authority should not be despised: The talent training mode of deep cooperation between college and enterprise is a breakthrough in terms of funds, management and implementation. This is undoubtedly a big conflict for the normal management of the relevant teaching management departments in university. There are also many management risks for the relevant leaders in charge of teaching. There is no doubt that there will be a great pressure on the use of funds by the chairman of the university (or the principal). Therefore, I think that To achieve a healthy and sustainable development of college-enterprise cooperation, it is necessary to eliminate these potential "obstacles" and never underestimate the role of the teaching authorities. Therefore, the college-enterprise cooperation should be implemented as carefully and thoroughly as possible; the management system should be implemented and monitored; and the path to achieve it should be clear and clear, and approved by the competent leadership and relevant teaching management departments before it can be implemented.

4) The supervisory role of students and parents should not be neglected: In order to meet the educational expectations of parents and students, both university and enterprise need to invest a lot of manpower and material resources. If these investments fail to meet the expected educational expectations of students and parents, students and parents will be strongly disgusted with this talent training model. In the process of deep cooperation between college and enterprise, many breakthroughs in conventional training methods will encounter serious obstacles from parents and students. Therefore, if we want college-enterprise cooperation to develop continuously and healthily, we should not neglect the supervisory role of students and parents. The author's university adopted the following measures: establishing a "university-enterprise community" and implementing a regular communication and communication system. Parents often cooperate with university and enterprise to form a strong "supervisory alliance" for learning under the condition of symmetrical information. The training of students plays the role of escorting, supervising and guiding.

III. RESEARCH AND PRACTICE ON DEEP COOPERATION BETWEEN COLLEGE AND ENTERPRISE OF ELECTRICAL INFORMATION COLLEGE OF CHANGCHUN GUANGHUA UNIVERSITY

The college-enterprise cooperation of the author's university has lasted for 10 years, and has become a brand of deep cooperation between university and enterprises in applied universities. In the evaluation process of the Ministry of Education, it has been highly recognized by several experts. At present, the development situation is good. On this basis, the author plans to build an industrial college, expand the scale of cooperation, and further develop in depth, in order to be able to serve other brother colleges and

universities. For reference, the cooperation modes are summarized as follows:

A. Enrollment Mobilization and Publicity

Both university and enterprises have jointly compiled the enrollment brochure, formulated the enrollment plan, jointly developed the enrollment website, and conducted propaganda in local high schools. Both sides have fully communicated and exchanged through several professional construction seminars, and both sides have invested considerable manpower and material resources in the implementation.

B. Freshmen Registration and Entrance Education

When the freshmen of college-enterprise cooperation major register, the reception team is composed of professionals from both sides of the university and enterprise (including Department director, enterprise teacher, counselor and class tutor). On the same day, both sides of the university and enterprise hold formal meeting with freshmen and parents. After the professional entrance education is carried out by the department head, the enterprise engineer introduces the college-enterprise cooperation model and enterprise for students and parents. Basic information, and future students to study and work in enterprises, career planning, etc., and on-site in the case of parents knowledge by university, enterprises, students to sign "employment security agreement".

C. Enterprise Outward Bound Training

During the military training period, the students who are organized by enterprise engineers to cooperate with university and enterprises use their spare time to carry out enterprise outward bound training for 2-3 times, to cultivate the spirit of unity and cooperation, hard work and endurance, and to establish the sense of cooperation and innovation, so as to lay a certain foundation for future project cooperation and development.

D. "2.5+0.5+1" Talent Training Model

The Student uses 2.5 academic year to complete the study of general curriculum module, professional basic curriculum module and professional theoretical knowledge module during the university period, then complete the study of comprehensive professional training module in enterprises, and finally complete professional practice and graduation design in the last year. The formulation of talent training mode and the setting of curriculum system are all completed under the supervision and guidance of the professional construction committee jointly participated by both university and enterprises. Seminars are held at least for 2-3 times per semester to fully dock and exchange the major issues involved in the professional construction.

E. Setting up the Practical Links of Combining Work with Learning

Against the background of deep integration of university and enterprise, it is easier to realize the combination of work

and study in professional practice. When the college is implemented, every semester of the 2.5 academic year in which students are in university arranges a course link of enterprise practice for 2-3 weeks, which is led by counselors and professional instructors. Students go to the front line of enterprise production (or training base) to carry out project development practice, and arrange the main content of practice according to the course schedule. The practice process is completely in accordance with the process of enterprise project development and personnel management. The student can not only learn what they can't learn from books, but also get to know the process of enterprise project development as soon as possible. In the process of students returning to university for study, it is obvious that the learning interest of students increases, their thirst for professional knowledge and their future career planning are no longer confused, which are very conducive to the formation of a healthy and benign style of class and study.

F. Centralized Training in the Context of Enterprises

After 2.5 university years, students will go to the enterprise for closed and centralized 0.5 year pre-post training, taught by the real project manager of the enterprise, used real project cases, completely in accordance with enterprise project management. After the project team completes its task, the group will respond and evaluate in accordance with the way of enterprise project acceptance, and according to the division of labor and the division of labor among the students in the project team. The overall performance is credited to students. After six months of intensive project training, most of the students have the ability and quality to engage in project research and development, and can directly participate in project research and development and design in future job.

G. Recommended Practice and Employment

After 0.5 academic year's intensive training, the enterprise first trained the students for 2-3 weeks in resume making and interview skills simulation training, and the university trained the students in safety education of enterprise practice and writing requirements of practice report. During the internship period, the students are provided with "double tutors" of enterprise engineers and university professional teachers to guide the internship, and fill in the internship and guidance records once a week.

H. Graduation Design Guided by "Double Tutors"

During the internship period, students will implement the "double tutors" guidance system in university and enterprises. Teachers of both sides clearly define their respective responsibilities, from the selection of topics, report of beginning of graduation project, issuance of design general design, detailed design, writing of design papers, graduation defense organization, etc. The graduation defense is carried out in the base of enterprise, and the graduation defense team is composed of "dual-tutors" in college-enterprise cooperation.

IV. CONCLUSION

Generally speaking, the deep cooperation between college and enterprises can be healthy and sustainable development, and also needs unconditional support from the leaders of relevant departments. Therefore, in addition to the impact of the above-mentioned internal factors, there is still a need for strong support from many external factors, both of which are indispensable. In addition, it needs to be emphasized that the rules and regulations formed in the process of college-enterprise cooperation must first be highly recognized and supported by the leadership and relevant departments, and the "green light" should be given when necessary, which is also an important guarantee to ensure the long-term and efficient operation of college-enterprise cooperation.

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