

On Improving the Practice and Innovative Capacity of Applied Undergraduate Talents through Enterprise Project

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Abstract. In the new era, when training talents, applied undergraduate colleges should take into consideration the needs of engineering production and engineering technology development. Schools should mainly train senior engineering and technical personnel with strong engineering practice capability and certain innovative spirit to serve regional economic development. How to cultivate talents that are required by the enterprises is the practical problem that needs to be solved urgently. This paper took engineering practice and innovation capability cultivation of engineering students as an example to explore effective ways and methods for cultivating innovative talents with engineering practice and innovation capabilities that meet the needs of enterprises. It analyzed mainly from the formulation of application-oriented talent training program, the establishment of enterprise-oriented curriculum system, and the practice of changing the practical teaching mode based on the real project of the enterprise.

1. Introduction

With ever deepening education reform, the reform of higher education has obtained remarkable achievements. However, there are still problems need urgent solutions. Of these, in higher education, it is essential to insist on application-oriented undergraduate education, which should cultivate high quality personnel with technical ability needed by enterprises while setting the training objectives^[1]. Yet, in terms of local colleges, most of them still apply old training model without distinct features, failing to cultivate innovative talents with technical ability. Based on the examples how engineering students practice and cultivate innovative capacity, this paper proactively explores the training model and methods to cultivate applied personnel needed by enterprises, as well as trains high quality talents adapting to local economic and social development through reform and practice.

2. Training Scheme and Curriculum System Guided by the Demand of Positions in Enterprises

2.1 Scheme to cultivate applied personnel emphasizing on integration of employment and teaching and cooperative education

Instead of traditional college-oriented model, our college investigates the schools of prospective students and the demand of positions in companies. By these ways, we can satisfy the knowledge, capacity and quality, establishing the instructional system and teaching procedures fitting for the training scheme^[2]. Then, we demonstrate it through peer institutions, prospective colleges, enterprises and industries. We finally conduct backward induction to ensure plan to cultivate personnel. Specific method is shown in Fig. 1

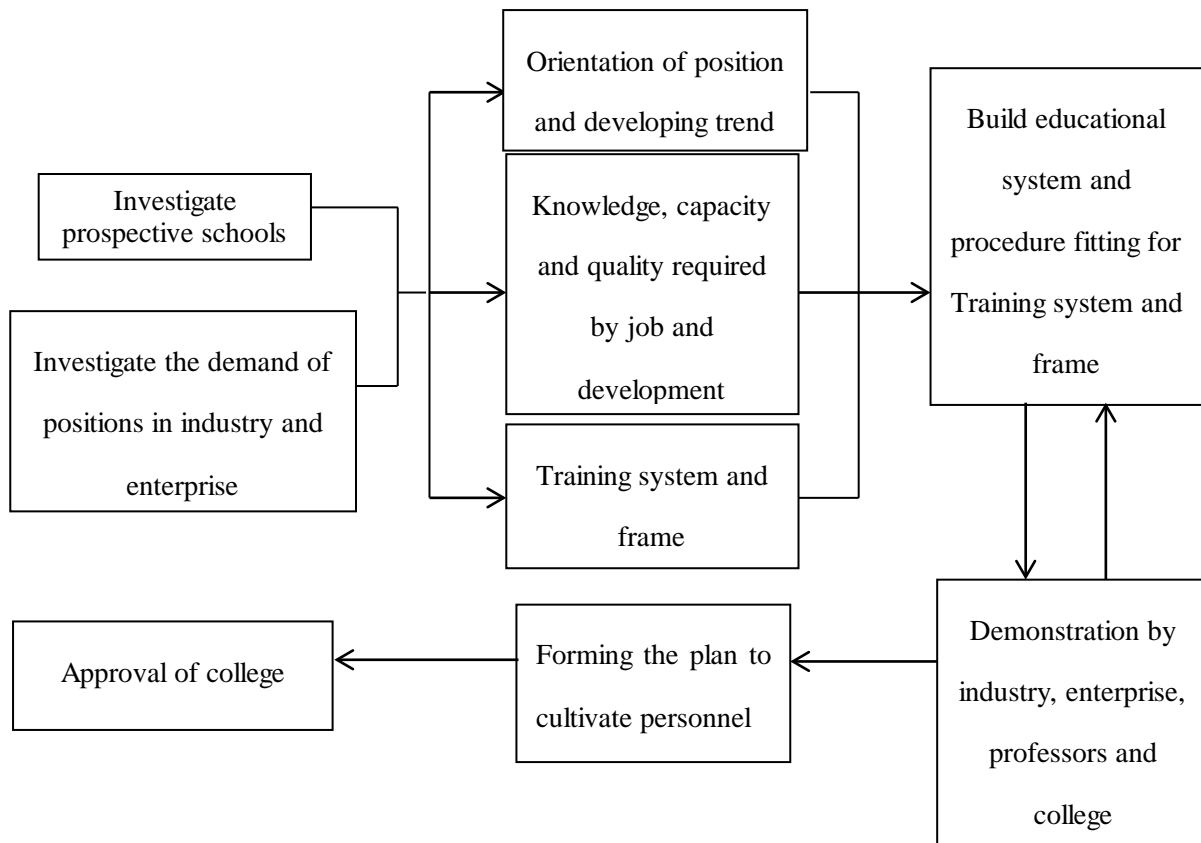


Fig. 1 Flowcharts to Set Talent Training Programs

2.2 Curriculum system oriented by the demand of positions in enterprises

In March 2016, our college constructed extramural practice and educational base -Wayezhou for undergraduates of Education Department in Liaoning Province. We took this as an opportunity to reach an agreement with enterprises on building extramural practice and educational base. According to the training requirements of modern apprenticeships with technical ability, we target at the goal to cultivate applied talents with high-end skills. Thus, we set training plans satisfying the demand of positions together with enterprises, introduce advanced job-training system from companies, build intramural practice and educational base simulating actual conditions of manufacture. In addition, we equip our campus with Computer Numerical Control (CNC) center, integrated classroom for PLC (Programmable Logic Controller) instruction, integrated classroom for electric control, integrated classroom for digital electronic technique, intramural training base for Marketing, training base for e-commercial operation and other training bases. While teaching, we insist on the training model that combines and alternates with the engineering, as well as cultivate the ability of professional practice and post capacity in intramural training bases. In extramural practice and educational base, we should improve students' post ability and let them conduct job rotation during internship. They should product and practice under the guidance of teachers in companies. Therefore, we can realize high-docking on and off campus, as well as in courses and jobs. Meanwhile, we could maintain good and continuous function of practice and educational base by cooperating with firms to conduct management system of it.

In curriculum system, we set enterprises' demand as a starting point, through which we set up positions and then establish courses. In our daily instruction, cooperating with company's practice, we should strengthen students' awareness of job and engineering, as well as improve their occupational quality and practice ability. We take mechanical design and automation (specialized in rifle bearing and manufacture) as an example. This major set four directions in employment, including workers maintaining CNC machine tools, design of machine and bearing, analysis and manufacture of bearing technology, process on bearing and maintenance of equipment. Under each direction, we should formulate basic courses and skill, specialized curriculum and ability, comprehensive practice and capacity.

Through these ways, we could enhance students' practice ability and quality of culture and capacity. Furthermore, we orient the prospective development of these four directions and refine the courses, providing necessary knowledge for students in the future.

3. Introducing Real Programs in Enterprises and Changing Teaching Model to Promote Students' Innovative Ability

We take the condition of most students in vocational colleges and the reform of teaching model into consideration. The urgent problems lie in how to promote students' practical ability, awareness of company and future employment^[3]. Currently, students fail to see actual condition of work on campus, which weakens their learning motive. Thus, it is quite important and practical to introduce actual assignment in class. It is beneficial to arouse their learning interest. The assignments come from the real condition in enterprises with complete circumstance, which would enhance their interest and exercise engineering practice ability. However, we should comprehensively consider the design, instead of choosing the assignment blindly and randomly.

3.1 Selecting the item

While selecting the item, we must adhere to following principles: firstly, representativeness. There are plenty of actual assignments, but we must select typical and representative assignments. Through these, students could judge the whole from the part, increasing instructional efficiency. Secondly, localization. While training personnel, we tend to cultivate local talents. Therefore, we should use more actual assignments from local firms while teaching. Combined with the regional developing status of colleges, we intend to choose representative bearing industry. Thirdly, operation. The actual work assignment depends on the environment of enterprises. Thus, in daily teaching procedure, we should connect it with colleges' real instruction and seek common ground while reserving differences, as well as select programs that can be practiced and exercised in class, which also can be taken as teaching cases.

3.2 Practice examples

1) Courses fitting with programs: Students of mechanical design and automation should conduct training practice of numerical control turning. The practice of class 2014 is settled in 6th term, lasting five weeks, in which the practice of numerical control turning lasts 2 weeks.

2) Selecting the program and its principles. According to the developing direction of building bearing industry of college-enterprise alliance in next five years, we should combine the employment direction of school address, enterprises and inner college, as well as the demand of bearing industry and actual condition to practice numerical control turning. We intend to choose programs of numerical control turning about bearing rollers. It is shown in Fig. 2

3) Theoretical knowledge in the program: descriptive geometry and mechanical drawing, engineering material and molding process, numerical control technology, machinery manufacturing equipment (including cutter), technology of mechanical manufacture (including fixture), interchangeability, technical measurement and etc..

4) Practical engineering knowledge in the program: selecting cutting tools and cutting parameters, designing and fabricating jig and fixture, executing numerical control program, measuring the size of workpiece (using caliper and micrometers), fabricating measuring template (wire electrical discharge machining), forming the procedure of processing technology and etc..

5) Form of carrying out project: In initial stage of the project, we should hire experienced masters in bearing industry to guide the project. During the project, we should summarize the problems in time and regularly communicate with and give feedback to enterprises, making the training practice of numerical control turning have similar environment as the factory. Thus, we could enhance students' awareness of practice and the entrepreneurial ability, realizing the college-enterprise cooperative model of "factory in college" and "college in factory".

6) Strengthening the sustainability of projects. When the daily instruction of bearing turning and practice meet enterprises' need of the product, we should carry out the process of more complicated

bearing ring as is shown in Fig. 3. It reveals the rising difficulty and diversity of the project, avoiding that students may lose interest in it due to simple duplication. It also enhances students' practical capacity.

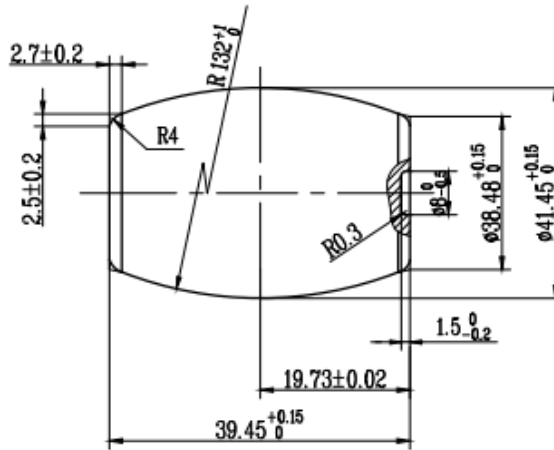


Fig. 2 Engineering Drawing of Bearing Rollers

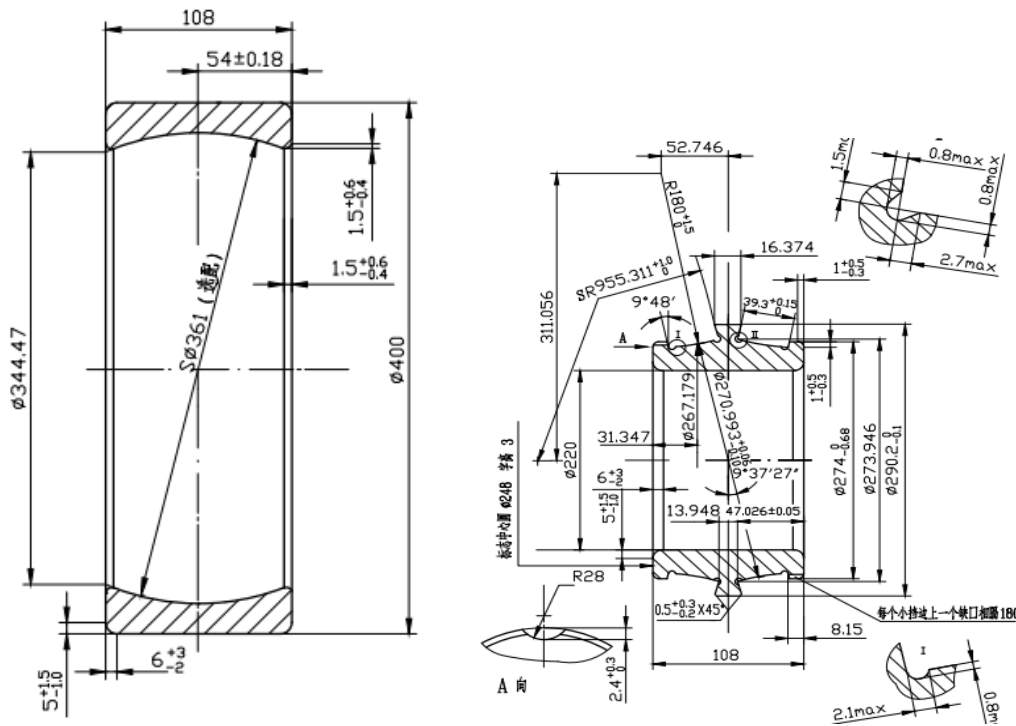


Fig. 3 Engineering Drawing of Bearing's Inner and Outer Rings

4. College and Enterprises together Build Faculty Satisfying their Need according to the Curriculum System

To promote the healthy development of teachers, we should combine our situation and formulate specific plan to build faculty. Firstly, we should cancel the restriction of teachers teaching basic theory, professional theory and practice, and break the limits of "theoretic instruction" and "technical instruction", in order to promote the engineering practice ability of teachers [4]. We should encourage teachers to exercise themselves in plants, participating in work in line with their speciality. They should know the actual requirements of skill, knowledge, ability and vocational quality, summarize the up-to-date project, which could be formed teaching program. In class, we should insist on students as main subject and teachers as orientation, based on capacity. It means that we should conduct instruction to improve

students' learning interest and participation. Our priority is to train them to solve practical problems, instead of passing on knowledge. Furthermore, we should complete the ability-focused assessment model combining procedure with results^[5]. In class, teachers must emphasize that "combining instructional content with job requirements, practice teaching with occupation skill appraisal". We should also integrate with the practical instructional model of "teaching in plants, learning while teaching and combining lecture and instruction", making students reach the basic requirement of "knowing and doing" and cultivate the vocational quality and professional ethics of "capacity, willingness, simplicity, steadiness and pragmatism".

5. Conclusion

By introducing the enterprise project into applied undergraduate education, great improvement has achieved in building curriculum system, cultivating students' engineering innovative capacity and teachers' engineering practical ability. Therefore, we should improve the practice and innovative capacity of applied undergraduate talents through enterprise project, which is valuable to popularize in practice and theory. The model also explores new approach for formulating the plan to train personnel and pattern for the cooperation between college and enterprise.

6. Acknowledgment

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