The Reform Measures and Implementation Results of Engineering Surveying Based on the Excellent Engineering Background

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Keywords: Excellent engineering, Measurement reform, Implementation effect

Abstract. The Chinese higher engineering education which has developed for several decades, in spite of its large scale, is far from the world level in the indicators of innovation and quality etc. At present, the increasing higher education in our country has exposed the more serious problem of employment. Market oriented employment mechanism inevitably make higher education to reform with the market changes continuously. Accordingly, the state has timely launched the plan of “excellent engineering”. This article describes that we have taken the reform measures to the problems in the teaching of engineering surveying according to the training requirements of the excellent project plan, based on the excellent background and combined with the implementation of the national excellence program of Surveying and Mapping Engineering in our school, and we have achieved good results through implementation.

Introduction

China has established a basic and complete system of higher engineering education and trained tens of millions of engineers and technicians in engineering science and technology since the reform and opening up in the last century[1-2].

At present, the increasing higher education in China has exposed the more serious problem of employment. According to the annual report on the quality of employment issued by the people's network on April 2, 2014, in 75 colleges and universities directly under the Ministry of Education, the total score of the employment annual report of only 22 universities reached 60 points. Their qualified rate is less than 30%. This fully shows that the employment of college students is not optimistic at present, but there are many vacancies in the reality. The root of the problem is not the supply and demand, but the result of the disjunction between higher education and social demand, unreasonable industrial structure, the too big gap between college Students' ideal and reality, the not high quality and ability of its own quality and ability etc [3].

The launch of the excellent plan

All colleges and universities in the world pay attention to "the practice and research of curriculum teaching" since the middle of the twentieth Century [4-5]. For example, the University of Applied Sciences of Germany (Fachhochschule) adopts the "3+1" model. Its cultivation goal is to cultivate the leading figures in the future engineering community and the students are required to master the “excellent” engineering skills.

Chinese higher engineering education but it is far from the world level in the indicators of innovation and quality etc [6].

Education is essentially an industry. Market oriented employment mechanism inevitably make higher education to reform in the idea of running a school, professional settings, teaching content, the construction of teaching team and so on to adapt to the needs of the market initiatively. The fierce competition in the market also requires us to change our ideas in teaching to cultivate the compound talents with a solid professional foundation, wide knowledge and the ability of engineering practice and innovation.
To this end, the state has timely launched the strategic decision of "excellent plan" in compliance with the development of the times. Its purpose is to improve the students' engineering consciousness, engineering quality and engineering practice ability through close cooperation between education and industry, universities and enterprises, taking the practical engineering as the background and taking the engineering technology as the main line, and then cultivate a large number of types of engineers.

Existing problems

1. More content and less time

The teaching of engineering surveying has both theory and practice. The theory teaching includes the measurement basis, the instrument structure and its principle, the measuring error basic knowledge, the basic theory of control measurement, the basic knowledge of topographic maps and its basic application, the engineering application of measurement skill and so on. The practice teaching includes the understanding and use of the instrument (Level, Digital level, Theodolite, Total station, GPS etc.), observation and processing of data and so on. The content of teaching is more and more miscellaneous. It's a challenge for both teachers and students who complete such a complex teaching task at 48 or 32 school hours. What's more, it is today that new instruments and new technologies are constantly updated. School hours are more inadequate with the teaching of new content.

2. Emphasis on theory and light practice

Although the practical requirements of engineering measurement are very strong, but the current teaching materials are still based on theory and less in the application of engineering practice, especially the introduction of modern surveying and mapping instruments. Many colleges and universities can only use some classic old textbooks because the speed of the textbook updating is slow. In the classroom, the teacher can only give priority to the theory when the current class is compressed. In spite of the teaching of theory, we have set up some inter class experiments. For example, the understanding and operation of the level, the understanding and operation of the theodolite, etc. Most of them are confirmatory experiments.

In our school, there are more than 10 majors that open engineering surveying course for example, Surveying and Mapping Engineering, Civil Engineering, Architecture, Geological Engineering, Mining engineering, Project cost and so on. The number of instruments per person is relatively limited with the expansion of Higher Education; In particular, some sophisticated instruments are inadequate. As a result, students’ practices are carried out in groups as units. The opportunity for students to contact the instruments is limited. Particularly non surveying and mapping specialties are serious.

Under the constantly emerging background of Surveying and mapping new technologies and new instruments, the teaching content of many colleges and universities is difficult to keep up with the pace of the times. The content of practical teaching is out of line with the practice of engineering. Thus it affects the cultivation of students' creative ability in engineering practice, and it seriously restricts the development of the combination of production, learning and research.

3. The single teaching method and lack of efficiency

The teaching of engineering survey consists of two parts, that is, theory and practice. The theory teaching and practice teaching generally is 2:1. The theory teaching is difficult to get rid of the shadow of "cramming" because of the more content and less time. So that the interaction between teachers and students is limited and it is difficult to mobilize the enthusiasm of the students. Practice teachings are usually after the theory teaching. A lot of practice can't really carry out because there is a large student and the practical teaching time, equipment, site and other resources are limited. They can only be demonstrated by teachers and students see them briefly. There is no practical teaching of practice.

4. The heavy result and light process

The comprehensive assessment of the engineering survey course consists of three parts, that is, the ordinary performance, the experimental results and the test results. The ordinary performance usually includes attendance, homework, and classroom questioning etc. Attendance and classroom questions are few because of the more teaching content and less time. The frequency of attendance in class or
experiment is less. There is not a lot of homework assignment after class and there is a plagiarism phenomenon. Therefore, the performance assessment is actually a kind of form. The ordinary performance and experimental results are generally high and the proportion of the exam results in the total score is low. So that students' total achievement can not reflect the comprehensive performance of the students in the whole teaching process. It is difficult to reflect the students' real ability.

The Reform initiatives

In view of the problems existing in the teaching of engineering survey, we combine the requirements of the excellent project training program and have taken the following reform measures.

1. **Increase and decrease the content, optimize the structure**

   With the emergence of new techniques and instruments in surveying and mapping, on the one hand, we supplement the content of the curriculum in time, such as total station, electronic level, RTK and other related knowledge, in order to maintain understanding of the development of the subject and to better adapt to the needs of social development. On the other hand, we cut down the knowledge point that is less used or even not used in the actual work under certain conditions at the time of class, such as steel tape distance, curve, and small triangle measurement knowledge, to meet the limit of lack of time in class. At the same time, we have made some adjustments to some of the teaching contents in order to facilitate the understanding and grasp of the knowledge of the students. For example, the Gauss projection is in advance to the second section in the first chapter. This section is the ground point is determined. So that students have a complete understanding of the measuring coordinate system.

2. **Open the laboratory to improve the engineering practice**

   The practice teaching and the theory teaching which penetrate each other, complement each other and separate themselves are the two links in the teaching system. The strength of the engineering practice ability is the vane of the practice teaching effect. Even though practice teaching allows students to be familiar with and master the measuring instrument, but there is a lack of ability to solve practical engineering. Thus, the students' working ability and social competitiveness are reduced. Through the opening of the laboratory, on the one hand, we can overcome the limitations brought by the limited practice of teaching. On the other hand, we focus on the goal of professional excellence project and construct a practical teaching system based on teacher guidance and independent innovation of students according to the actual needs of the professional post groups to enlighten and cultivate the creative thinking of the students and to Improve the students' ability to analyze and solve problems in practical engineering.

   In addition, the school or college can also enter into the base of production, learning and research cooperation with enterprises for students to get more opportunities for business practice. We use the annual school level mapping skills competition or select the machine for participating in the Jiangxi province or national surveying and mapping competition to attract students to take an active part in the measurement practice. This will stimulate the students' enthusiasm for learning, promote classroom teaching and lay the foundation for faster integration into the future work.

3. **Reform the teaching method and improve the teaching effect**

   The teaching effect is good or bad. To a great extent, it depends on the application of teaching methods and means. So we use a variety of teaching methods to give full play to their advantages in the teaching of engineering surveying. Such as traditional book teaching, it is gradual and it is helpful for students to accept and digest knowledge. Multimedia teaching is flexible in form and easy to use. The demonstration teaching is intuitionistic and easy to understand and so on. In a word, in the teaching course, we combine a variety of teaching methods and means organically and achieve the integration of curriculum related knowledge through the complementation of their advantages to be convenient for students to understand, digest and absorb. This ensures the excellent teaching effect in the course.
4. **Reform the evaluation system and strengthen the teaching process**

Curriculum evaluation is the baton that guides the teachers and students. Most of the students and teachers always seek "good achievements" under the guidance of the current evaluation system. In order to cultivate the outstanding engineers of the future, we must go beyond the current evaluation system based on the "knowledge point" and form an evaluation system which is infiltrated the whole process of cultivation based on quality promotion to meet the social needs of the new period. The aim of the reform of evaluation system is to realize the change from "learning achievement" to "learning effectiveness" and guide students to change from "test results" to "learning process" to highlight the assessment of the practice ability.

To this end, we strengthen the evaluation of the teaching process in the theory teaching. For example, we name in each class. We all set up our homework in each chapter. We open comment students homework after each homework is carefully corrected and quantified. At the same time, we will praise well and point out. Its purpose is to let the students understand their homework clearly. We strengthen the management of the group and the quality of the report on the practice teaching. We have further strengthened the teaching process through the reform of the evaluation system.

**Implementation effect**

Through the implementation of the above reform initiatives, we have achieved good results in the teaching process, the students' practical ability, the curriculum evaluation and so on.

**(1) The teaching process embodies**

The reform measures mentioned above have been carried out in the teaching of the 15 grade geological engineering survey in 1 year. We have achieved good teaching effects. There is a clear promotion in attendance rate, pass rate, average achievement and so on, as shown in Figure 1.

![Figure 1. The teaching process is embodied before and after the curriculum reform(%)](image)

**(2) The embodiment of students' practical ability**

The core idea of engineering education is to emphasize the goal of curriculum education, to emphasize the students' learning results and stipulate the engineering practice ability that students should have when they graduate [8]. We open the laboratory to the students and organize students to carry out the intramural surveying and mapping skills competition every year in order to create more practical opportunities for students. At the same time, we also select excellent students to participate in the province and national competition of Surveying and mapping skills and have achieved good results, as shown in Table 1 and Table 2.

**Table 1. The students won the prize in the mapping skills competition.**

<table>
<thead>
<tr>
<th>S/n</th>
<th>Students</th>
<th>Award-winning</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>He Weiguo,</td>
<td>the first prize of the digital mapping</td>
<td>2016 &quot;Tianyu Cup&quot; Fourth</td>
</tr>
<tr>
<td>2</td>
<td>OuYang Dongsheng,</td>
<td>the first prize of the traverse survey</td>
<td>National College and university students</td>
</tr>
<tr>
<td>3</td>
<td>Xiao Gang, Liu</td>
<td>the second prize of the second level leveling</td>
<td>surveying and mapping skills competition</td>
</tr>
<tr>
<td>4</td>
<td>Renzhi</td>
<td>the first prize of the measurement program design</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Zou Shupan, HuangLiexing</td>
<td>the first prize of the group general achievement</td>
<td></td>
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</tbody>
</table>
Table 2. The students won the prize in the mapping skills competition.

<table>
<thead>
<tr>
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<th>Award-winning</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Zheng Wenjie,</td>
<td>the first prize of the second level leveling</td>
<td>2017 Jiangxi province</td>
</tr>
<tr>
<td>2</td>
<td>Qiu Fengqin,</td>
<td>the first prize of the traverse survey</td>
<td>&quot;CNOOC Cup&quot; mapping</td>
</tr>
<tr>
<td>3</td>
<td>Liu Zhiqiang,</td>
<td>the second prize of the digital mapping</td>
<td>skills competition</td>
</tr>
<tr>
<td>4</td>
<td>Hu Xuhang</td>
<td>the first prize of the group general achievement</td>
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</table>

(3) Curriculum evaluation
The teaching of "engineering survey" has achieved good results through reform and practice. Such as the evaluation in the teaching supervision briefing [2016] 11: Proficient in content, clear explanation, the detailed illustrations and the case to the point. The teaching is reasonable organization and connected with reality. Teaching emphasizes the cultivation of students' ability to analyze and solve problems. At the same time, the course teaching is highly appraised by the students too, such as the summary of the students' comments in Table 3. In addition, there is good colleague’s accreditation. In a word, the comprehensive evaluation of the course teaching is excellent.

Table 3. Students’ curriculum evaluation.

<table>
<thead>
<tr>
<th>Serial number</th>
<th>Summary of students’ comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>The lecture is interesting</td>
</tr>
<tr>
<td>2</td>
<td>The teacher talks about a wide range of knowledge.</td>
</tr>
<tr>
<td>3</td>
<td>Conscientious and strict teaching attitude</td>
</tr>
<tr>
<td>4</td>
<td>Teachers have a sense of responsibility</td>
</tr>
<tr>
<td>5</td>
<td>Class is very energetic</td>
</tr>
</tbody>
</table>

Conclusion
This article analyzes the problems in the teaching of engineering surveying based on the “excellent plan” background. And then, we combine the excellent project plan to cultivate the requirements and put forward targeted reform initiatives. We have achieved good results in the reform through the implementation of teaching.

Acknowledgement
This research was financially supported by the fund project of the Jiangxi Provincial Education Department (JXJG-15-7-5)

References