An Approach to Integrated Engineering and Humanities Education in Lanzhou Jiaotong University

Xinzhu Yang[1], Pu Gao[2], Xiaolei Chen[3]

[1,2]Schoolof Mechatronic Engineering,Lanzhou Jiaotong University,China
[3]School of Electrical and Information Engineering, Lanzhou University of Technology, China

yangxinzhu@mail.lzjtu.cn[1]

Abstract

The engineering education should be reconsidered and explored in China. In this paper the practice of how to introduce humanities education into engineering education in Lanzhou Jiaotong University is studied and an approach to integrated engineering and humanities education is proposed. This approach introduces humanities education into the traditional engineering education format. The research shows that humanities education can provide students majoring in engineering with fresh perspectives and ideas to expand their horizons and creativity. The students who are trained under this integrated education method have better achievements than those trained under the traditional engineering education approach.

A survey about the working performance of engineering graduates from Lanzhou Jiaotong University was conducted. Based on the results of the survey and the students' experience in the University, the authors have made a research into the relationship between the promotion of students' achievements and their level of humanities education. It is found that the humanities education plays an important role in students' career development. Those students who received more humanities education tend to have better performance. This approach has been practiced in the School of Mechatronic Engineering in the University. And the concerning research has proved that this approach can improve the quality of engineering education.

In summary, while it is very important to make the best use of the successful traditional education methods in engineering, humanities education has a unique positive and supportive effect on engineering education, and it should be introduced and combined better with engineering education, since it can widen engineering students' visions and help them be all-round- developed persons for the society.

Introduction

With the rapid development of China, many challenges arise in the traditional engineering education, among which, the most formidable is how to cultivate technically trained engineering students in limited credit hours. Here, at Lanzhou Jiaotong University, the humanities education has been introduced into the traditional engineering education.

The purpose of this paper is to describe and assess the integrated engineering and humanities education curriculum at Lanzhou Jiaotong University. The curriculum of each academic year is described, and its impacts and benefits for students are discussed.

Integrated Engineering and Humanities Curriculum

In order to find the effect of humanities education on engineering education, the humanities education throughout the programs of study has been developed and implemented since 2004 in the School of Mechatronic Engineering at Lanzhou Jiaotong University. Humanities education was introduced into the the engineering curriculum for four academic years, with compulsory courses in humanities integrated with those in engineering, The objectives of this improved curriculum are that the students will be able to integrate engineering profession and ethics in their work as it relates to the context of engineering technology in society; Integrate engineering professionalism, ethics, and the

environment in their work and as it relates to the context of engineering in society. The curriculum is meant for all engineering students and all engineering faculties are involved in the curriculum. The clinic sequence and its themes are summarized in Table 1.

Table 1 The humanities education curriculum for mechatronic engineering students at Lanzhou Jiaotong University

Year	Curriculum
First	Legal basis Public relations
Second	Introduction to Chinese culture The development history of science and technology
Third	Basic music theory Introduction to art Design introduction
Fourth	Art appreciation Music appreciation

Student Surveys

The engineering students of Lanzhou Jiaotong University have participated in a semi-annual survey. The survey was carried out at the beginning and end of each academic year for the last 5 years in order to assess their engineering self-confidence, satisfaction with the program. Students' responses to engineering clinics have been overwhelmingly positive, as Table 2 shows.

Table2 Attitudes toward engineering clinic by mechatronic engineering students by year of survey

Attitude statement	Date of survey				
	2004	2005	2006	2007	2008
Overall the engineering clinic experience is beneficial to engineering students	81.2	83.4	85.6	88.5	92.4
Clinic enables students to connect things from different disciplines they wouldn't otherwise do	72.5	74.6	76.8	80.3	85.2
humanities education can provide fresh perspectives and ideas for students	73.5	75.2	77.1	81.6	84.3
humanities education can expand students' horizons and creativity	74.5	76.4	78.2	80.5	83.6

The impact of the curriculum at Lanzhou Jiaotong University on the students can also be measured by the high percentage of undergraduates from the program who go on graduate study. Table 3 shows the number and percentage of Lanzhou Jiaotong University mechatronic undergraduates continuing to full-time graduate school in engineering.

According to 2006 statistics from the Ministry of Education of PRC, approximately 15% of mechatronic engineering undergraduates continue in graduate studies. However, from table 3 we can see between 20% and 30% of the mechatronic engineering undergraduates from Lanzhou Jiaotong University will go on to graduate study .Thus, Lanzhou Jiaotong University mechatronic engineering graduates are more likely than their peers nationally to pursue graduate studies.

Table 3 Lanzhou Jiaotong University mechatronic engineering undergraduates pursuing graduate studies since Fall 2004

Graduation year	**Total number of engineering undergraduates**	**Number of engineering undergraduates pursuing graduate studies**	**Percentage of understudents pursuing graduate studies (%)**
2004	90	17	19
2005	110	25	23
2006	120	30	25
2007	140	37	26
2008	170	55	32

Employer Surveys

The sound evidence of the impact of clinics on the mechatronic engineering students was the survey data from employers. The surveys have three levels rating scale of average, good, and excellent. Regarding students' abilities to solve problems using mathematics, science, and engineering knowledge, in 2003 83% were rated good or better. This improved in 2004 such at 95% were rated good or better. When asked about students' abilities to work effectively in multidisciplinary teams, 85% in 2003 and 92% in 2004 were rated good or better. In 2003, 89% were good or better in verbal communication and 81% were good or better in written communication. Similarly in 2004, 93% for verbal and 90% for written were good or better. Table 4 shows the result of the survey.

Table 4 Surveys from the employers of Lanzhou Jiaotong University mechatronic engineering students

Attitude statement	**Date of survey**	
	2003	**2004**
abilities to solve problems using mathematics, science, and engineering knowledge	83% good or better	95% good or better
abilities to work effectively in multidisciplinary teams	85% good or better	92% good or better
verbal communication	89% good or better	93% good or better
written communication	81% good or better	90% good or better

Conclusions

The survey data from students and employers have confirmed the positive contributions of the clinics, and provided evidence that humanities education can provide fresh perspectives and ideas for engineering students to expand their horizons and creativity. The students who are cultivated under this integrated education method would have better achievements than those students who are cultivated under the traditional engineering education approach. Future work includes testing the curriculum in a larger range and making improvements to the curriculum

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