



Practical exploration of effective engineering training teaching for liberal arts students

Rui Zhao^{a,1}, Jiading Bao^{b,2,*}, Shuilong He^{b,3}

^aSchool of Language and Literature, Guilin University, Guilin, Guangxi, 541006

^bSchool of Mechanical and Electrical Engineering, Guilin University of Electronic Technology, Guilin, Guangxi, 541004

¹328886517@qq.com, ²jdbao@guet.edu.cn, ³247613186@qq.com

*Corresponding author's e-mail: jdbao@guet.edu.cn

Abstract. With the deepening of modern education concept, the cultivation of students' comprehensive quality has become the consensus of current front-line educators. However, due to the limitations of China's traditional education system, liberal arts students in colleges and universities generally have insufficient practical and innovative abilities. Educators should pay attention to this problem and strengthen the engineering training of liberal arts students to enhance their engineering awareness and ability and promote their comprehensive development. In view of this, this paper mainly analyzes how to effectively carry out engineering training teaching for liberal arts students.

Keywords: Liberal Arts Students; Engineering Training; Teaching Practice

1 Introduction

With the continuous progress of social economy and science and technology, the social demand for talents is also getting higher and higher. 'Interdisciplinary, knowledge integration and technology integration' have become the most significant characteristics of modern society's demand for talents [1]. Under the background of talent requirements in the new era, colleges and universities have taken the training of compound and innovative talents as an important goal, and put forward the interactive training program of arts and science, which requires science students to have humanistic quality, and liberal arts students to have engineering consciousness. By strengthening engineering training for liberal arts students, students can not only learn technological knowledge and skills, but also acquire the development of practical ability and innovation ability, strengthen students' engineering consciousness, improve students' comprehensive quality, and lay the foundation for their subsequent development.

2 Necessity of engineering training for liberal arts students

Under the current college entrance examination system of our country, students are divided into arts and science early, which makes the current liberal arts students in colleges and universities in our country generally have low practical ability, lack of logical thinking, scientific literacy and engineering knowledge. Compared with the science and engineering students, they are obviously in a disadvantaged position in actual employment. With the advent of the information age, traditional industries are facing the gradual elimination, and new manufacturing industries are constantly flooding into the market. With the rapid technological innovation, many students are facing the employment test, and the current complex talents can better adapt to the trend of The Times. With the deepening of college education reform, it has become a national strategy to promote innovation and entrepreneurship education. In this context, engineering training is added to liberal arts courses, so that liberal arts talents can have science and engineering experience and engineering consciousness, improve their own knowledge structure, master practical skills, and improve their comprehensive quality. Therefore, the engineering training practice of liberal arts students has also become the main breakthrough to cultivate applied liberal arts talents and improve the level of innovation and entrepreneurship.

3 Practical significance of engineering training teaching for liberal arts students

3.1 Improve knowledge structure

The current engineering training in colleges and universities reflects the latest technical achievements, such as numerical control equipment, computer simulation technology, robot technology, engineering welding technology, etc. [2]. For the engineering training of liberal arts students, it is required to condense the basic engineering knowledge and skills into training tasks and projects, so that students can understand the structure, manufacturing process and working principle of typical industrial products, enrich their engineering knowledge and complete their knowledge structure.

3.2 Mastering practical skills

Although the practical ability of liberal arts students is weaker than that of science students, they are better than science students in terms of aesthetic level, innovative thinking, etc. This is enough to show that liberal arts students are not born with poor hands-on ability, but usually lack opportunities for hands-on practice. The development of engineering training can provide more hands-on practice opportunities for liberal arts students, promote them to master more practical skills, and improve their hands-on practice level.

3.3 Strengthen engineering awareness

Due to the problem of specialty setting, liberal arts students seldom have the opportunity of engineering practice in their daily study, so their engineering awareness is relatively weak and they lack the basic knowledge of engineering feasibility, and they are prone to whimsy in the process of engineering training^[3]. By strengthening engineering training, liberal arts students can accumulate more useful engineering experience, enhance engineering awareness, and obtain the development of engineering practice skills in the process of analyzing and solving problems.

4 Difficulties Faced by Liberal Arts Students in Engineering Training and Teaching

4.1 Low interest in learning

Due to the lack of basic engineering knowledge and skills, liberal arts students will encounter greater difficulties in engineering training, and thus have resistance, fear of difficulties and other emotions to engineering training, and gradually lose interest and confidence. When students lack interest in learning, their enthusiasm in engineering training will be relatively low, and it is difficult to obtain good teaching results. Therefore, before carrying out engineering training, educators should do a good job in engineering training publicity, so that students can realize the importance of engineering training and stimulate students' interest in learning, so that they can more actively participate in engineering training.

4.2 Limited class hours

In the context of the new liberal arts, most universities in China have carried out corresponding engineering training for liberal arts students, but the limited class hours set have increased the difficulty of engineering training^[4]. First of all, in the limited class hours, teachers need to optimize the selection of engineering training content, focusing on selecting some typical processes. However, in the actual engineering training, many engineering projects have a strong comprehensiveness. Most of them are based on the original project and gradually add new processes and technologies. Students need to learn and master more, which increases the burden of students' engineering learning and training. Secondly, although the technical difficulty requirements for engineering training of liberal arts students are lower than those of science students, they cannot be lower than the relevant requirements of quality education. In the limited class hours, most students are unable to accurately master the technology, and the quality of engineering training is difficult to be guaranteed.

5 Approaches to Engineering Training Teaching for Liberal Arts Students

5.1 Strengthen pre class training and learning awareness

As liberal arts students have weak engineering awareness and limited engineering knowledge and technology, they do not know what engineering training is, why engineering training is required, and how to carry out engineering training. For this reason, before carrying out engineering training, it is necessary to do a good job of engineering training education and training for liberal arts students, and strengthen students' awareness of engineering training. To this end, educators can make a promotional video of the contents of engineering training courses and the application of engineering technology in real life, so that students can understand the importance of engineering training and enhance their learning motivation. At the same time, before the formal engineering training, the education personnel also need to do a good job of safety education, enhance the safety awareness of students, and help students form a rigorous engineering training attitude. For example, teachers can teach students about safety accidents that are very easy to occur in engineering training, and how to deal with and reduce the occurrence of safety accidents through safety accident examples. Then, the teacher can lead students to interpret the Safety Agreement and ask them to sign it, so that students can consciously abide by the relevant safety rules and regulations. In the process of engineering training, teachers should also strengthen safety education and guidance, and require students to operate safely according to relevant specifications to ensure the safety of engineering training.

5.2 Optimize curriculum arrangement and highlight practical characteristics

Due to the individual differences of students, their learning needs for engineering courses will also be very different. For this reason, before carrying out engineering training, the engineering training personnel should conduct a visit and survey to the department of the liberal arts college, and formulate the engineering training course menu according to the characteristics and needs of the college for the colleges to choose [1]. At the same time, the college should set up elective courses to enable students to choose engineering training courses according to their own interests and development needs, so as to meet students' personalized and diversified learning needs to the maximum extent. In the formulation of engineering training courses, practical courses, such as woodworking DIY, computer disassembly, etc., should be taken as the main course, so as to better mobilize students' interest in learning, promote students to master more practical skills, and improve the quality of engineering training.

5.3 Innovate teaching methods and promote personality development

In the past engineering training, the mode of 'teachers' explanation and demonstration, students' imitation and practice' was mainly used. The subjectivity and initiative of

students could not be reflected, which was not conducive to the personalized development of students. Therefore, the engineering training educators should actively introduce advanced engineering training methods, such as interactive teaching, task driven, project teaching, etc., to achieve the optimization and innovation of engineering training, so that students can participate in it highly. In addition, engineering trainers should pay attention to the advantages of liberal arts students at the innovation level, and create an open engineering training environment at the same time, so that students can create freely according to course requirements [5]. Taking ‘3D printing’ as an example, when students have mastered the basic operation, teachers can let students give full play to their imagination, design their own works, and complete the production of works. The figures 1 and 2 are some excellent works of liberal arts students.



Fig. 1. Student Creative Works 1 [draw myself]



Fig. 2. Student Creative Works 2 [draw myself]

5.4 Optimize homework design and consolidate learning achievements

In the past engineering training, teachers usually designed some imitative homework after class according to the content of textbooks, allowing students to complete independently and fill in the internship report. This kind of homework has a strong

generalization, which is not conducive to students' subjective initiative and creativity. For this reason, teachers need to optimize the design of homework after class. Through some practical homework, students can combine their engineering knowledge and skills with real life, and strengthen their engineering awareness and ability in the process of analyzing and solving practical problems [6]. At the same time, teachers also need to optimize the Internship Report, guide students to reflect and summarize the engineering training process, and consolidate the learning results. Taking 'fitter' as an example, teachers can design the following internship reports:

Table 1. Internship Report

What tools did you use in the fitter course? What is the purpose of these tools?	
What do you think is the purpose of the fitter course? What did you learn from fitter work teaching?	
What do you think of your work? What is your creative idea?	
What do you think the fitter course needs to be improved?	

6 Conclusion

To sum up, higher-education institutions and faculties affiliated should well recognize that for students majoring in liberal arts, engineering practice not only optimize the students' knowledge structure and broaden their practical skill sets, but also strengthen the students' engineering sense. Being aware of cognitive characteristics and future career goals of these students, engineering practice program should be designed in such a way that more engineering field opportunities being created and provided to systematically train the students' hands-on and innovative abilities.

Acknowledgements

This research was supported by the Guangxi Higher Education Undergraduate Teaching Reform Project under Grant 2021JGA180 and 2022JGB191.

References

1. Wang Yuming. Research on the reform of comprehensive practical training teaching of the following subjects in the engineering training model [J]. Journal of Chaohu University, 2018, 20 (01): 133-137
2. Yang Linfeng, Xu Guangquan. Teaching Design of Welding Robot Engineering Training for Liberal Arts Students [J]. Welding Technology, 2020, 49 (07): 55-57

3. Wu Xinliang, Yang Yuyan, Li Quancheng. Exploration on Engineering Training Teaching for Liberal Arts Students [J]. *Experimental Technology and Management*, 2015, 32 (11): 194-196
4. Huang Yiming, Jiang Ping, Xiao Dingyu. Exploring the training mode of engineering training under the background of new liberal arts [J]. *Contemporary Education Practice and Teaching Research*, 2020 (14): 172-173
5. Zhang Zhigang. Optimization and Innovation of Engineering Practice Education in Applied Technology Universities [J]. *Journal of Guiyang University (Natural Science Edition)*, 2016, 11 (03): 82-84
6. Liu Yimin. Exploration of Engineering Training Teaching for Liberal Arts Students in Colleges and Universities [J]. *New Curriculum Research (Mid term Journal)*, 2016 (08): 19-20

Open Access This chapter is licensed under the terms of the Creative Commons Attribution-NonCommercial 4.0 International License (<http://creativecommons.org/licenses/by-nc/4.0/>), which permits any noncommercial use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license and indicate if changes were made.

The images or other third party material in this chapter are included in the chapter's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the chapter's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder.

