

Teaching Reform of Coal Mining Course under Background of New Engineering

Junxiang Zhang*, Lina Qu, Liang Chen, Qi Liu

School of Energy & Environment Engineering, Zhongyuan University of Technology,
Zhengzhou Henan 451191, China

Abstract

As the core course of mining engineering and safety engineering, the teaching quality of Coal Mining course presents an important influence on personnel training in the mining field, as well as the coal industry in China. Based on a long-term observation and tracking, several existing problems, such as backward teachers' team, outdated teaching concept, scarce teaching resources, inadequate practical training, were analyzed in traditional teaching mode. Therefore, this study proposed a series of reform measures, by means of the teachers' team management, teaching mode innovation, teaching resource integration, virtual simulation laboratory construction, to enhance the students' practical ability, enthusiasm and initiative. The findings of this work can provide reference and guidance for improving teaching quality reform level.

Keywords

Teaching Quality; Personnel Training; Teaching Mode; Teachers Team.

1. Introduction

Main energy status of coal resources will last for a long time in China [1]. After the rapid development of the 13th Five-Year Plan, the technical equipment of the coal industry has been greatly updated and improved [2]. With the accelerated development of global low-carbon economy, coal industry will face major challenges during next 14th Five-Year Plan [3]. Therefore, the professional training of specialized personnel in the mining field is an important guarantee for coal mine science and technology developing in China [4].

Coal Mining, mainly focusing on Underground Coal Mining, Non-Coal Mining, open-pit mining and other contents, is a required course of mining engineering and safety engineering [5]. Recently, many scholars conducted considerable research on teaching reform of Coal Mining. For example, Tao et al developed an online animation learning platform for arousing students learning enthusiasm, and the results also proved that the learning effect of students has been greatly improved [6]. Based on the analysis of the problems existed in traditional teaching mode, Ding et al have proposed improvement measures for optimizing teaching content and constructing teaching mode, which have achieved good reform effects in the teaching practice [7]. Thorough analysis of the backward reasons of mining engineering progress, Feng et al point to the new scientific direction of "intelligent mining", and some intelligent discipline theories have been applied in course teaching [8]. Zhang et al formulated the construction objectives and plans for facing the challenges of mining engineering specialty reform, aiming to optimize the teaching method, practice content and training mode [9]. According to the progress requirements of mining engineering, Sun et al analyzed the problems in the current teaching mode, and put forward a series of curriculum reform measures, such as updating teaching content, increasing teaching activities, strengthening practical teaching [10].

However, due to the backward teaching staff, outdated teaching concept, insufficient teaching resources and inadequate practical training and other problems, traditional teaching mode can

not meet the requirements of modern personnel training. Therefore, deepening the teaching reform of Coal Mining, promoting the integration of high-tech industrial technologies in coal mine, and cultivating mining specialized talents are the urgent need for the high-quality development of the coal industry in the 14th Five-year Plan period.

2. Existing Problems in Traditional Teaching Mode

To meet the training needs of mining professionals and the self-development of student, the teaching content, teaching methods and practical process of Coal Mining are urgent to be reformed. Through a long-term observation and tracking of the teaching status of the traditional mode, in Zhongyuan University of Technology case, the main problems existing in traditional teaching mode are as follows.

2.1. Backward Teachers' Team

The professionalism of the teachers' team determines the cultivation quality of professional talents. The root causes of the backward teachers' team in traditional teaching mode can be summarized in three points. First, teacher virtue cultivation should be strengthened, some of them lack professional dedication and responsibility. Second, due to the insufficient full-time teachers quantity and excessive students lead to a modest teaching effective in a large class. Third, scientific research and teaching capacity of several teachers are relative low, lack of senior academic experts and professors. In addition, the teaching content that excessive reliance on specialty textbooks can not reach the professional objectives of personnel training.

2.2. Outdated Teaching Concept

Teaching difficult points of Coal Mining are to cultivate students' spatial cognition of underground Coal Mining system. For the traditional teaching mode, the lecture process mainly explains the writing knowledge by PowerPoint and blackboard writing. Conformist teaching content, conservative teaching methods, outdated teaching concept have caused boring teaching effect, it also leads to the reduction of students' enthusiasm for independent learning and the thirst for specialized knowledge.

2.3. Scare Teaching Resources

In view of less access to learn specialized knowledge in current teaching mode, it is difficult for students to master the specialized theory only depend on the course learning process. And the limited opportunities for exchange study among teachers and students can not obtain the sufficient feedback. As a result, students are required to spend a lot of spare time to autonomous learning. Thereby the teaching and learning quality can be ensured.

2.4. Inadequate Practical Training

Coal Mining is an applied science based on engineering practice, especially for cultivating professional practical ability of mining method, roadway layout, mine exploitation, mining area disposal, and other professional skills. However, less simulation equipment and experimental conditions, especially for non-geological universities, limit the teaching resources and practical content. Thus leading to a low practical participation and weaken the practical ability training of students, which are an important factor restricting the teaching quality of Coal Mining.

3. Teaching Reform Measures

Aiming at the above-mentioned existing problems in traditional teaching mode of Coal Mining, this work proposed a series of teaching reform measures to enhance teaching quality and meet training objectives of the demand of mining science development.

3.1. Teachers' Team Management

The professional ability of teachers is critical to reflect specialty education level. Constructing an innovative research-oriented teachers team is an essential guarantee of teaching quality. First, the universities should pay great attention to the strengthen of teachers' vocational ethics, and ensure the systematic ideological and political training to the full-time teacher. Meanwhile, senior academic professor and young outstanding doctors should be constantly introduced. Strengthening integrating professional academics and frontier talents can optimize the personnel structure and construct a high-quality talent team. Moreover, improving supervision management mechanism is an important measure for evaluating teaching quality, increasing teaching feedback, and stimulating teachers' enthusiasm.

3.2. Teaching Mode Innovation

The innovation of teaching concept and mode is an important approach for teaching reform. Developing a "student-centered" innovative teaching mode, breaking traditional teacher as the subject ideas, thus bring into full play students' role in the teaching process. The primary task for teachers is to optimize teaching content and change teaching methods. It is necessary to integrate some actual mine cases into theory teaching, thus improving students' ability of initiatively consider and solve complex problems. By this way, teaching mode innovation can help to form a benign interaction between teachers and students, not only to promote teaching and learning, but also stimulate students' enthusiasm for independent learning.

3.3. Teaching Resource Integration

Nowadays, with the rapid development of Internet technologies, assistant teaching system using Internet function becomes an important teaching method in information age. Therefore, make full use of Internet resources, such as developing the multimedia teaching resource database, can offer and share more learn resource for teachers and students. For example, it is needed for teachers to establish the digital curriculum and online teaching platform, optimize Internet teaching resources, increase test questions library, for the top-level design. Meanwhile, a quality curriculum course, i.e. MOOC, wisdom tree, rain classroom, should be introduced for helping students to preview, consolidate and review, thus avoiding spending much spare time students to seek teaching resources. In addition, teachers are encouraged to create the communication groups of QQ, WeChat, Ding Talk groups, it is conducive to strengthening communication between teachers and students, handle students' queries timely.

3.4. Virtual Simulation Laboratory Construction

Most case studies demonstrate that the construction of virtual simulation laboratory is an effective measure for enhancing students' practice ability. For instance, a virtual simulation lab reducing the proportion of actual underground conditions has been gradually constructed in Zhongyuan University of Technology, for simulating ventilation, transport, driving system, and other control facilities. Through practical training in virtual simulation lab can help students to deepen understand of various mining methods, so as to cultivate students' ability in solving practical problems for living up to "Knowledge and Action Are One". Therefore, virtual simulation laboratory construction not only compensates for the deficiency of the traditional teaching, but also benefits students to learn the complex and abstract professional knowledge, and significantly enhances the students' participation and enthusiasm.

4. Conclusion

The teaching quality of Coal Mining curriculum is a direct result of personnel training, scientific and technological innovations, and academic development in mining engineering. Based on long-term observation and tracking of traditional teaching process, this work analyzes the

cause of the existent key problem, such as backward teachers' team, outdated teaching concept, scarce teaching, inadequate practical training, in Coal Mining curriculum teaching. And a series of reform measures of teachers' team management, teaching mode innovation, educating resource integration, virtual simulation laboratory construction, is proposed to improve teachers' accomplishments, update teaching content, optimize Internet resources, strengthen students' practical ability. Above-mentioned reform measures have been implemented in Zhongyuan University of Technology and achieved a satisfying effect. The findings of this work can provide reference for relative teaching reforms of similar engineering majors, and lay a solid foundation for personnel training of mining development in a new area.

Acknowledgments

Henan higher education teaching reform research and practice project (2021SJGLX222); Graduate educational quality promotion project of Zhongyuan University of Technology (JG202256); Teaching reform research and practice project of Zhongyuan University of Technology (2022ZGJGLX046 & 2021ZGJGLX010); Ideological and political model course building project of Zhongyuan University of Technology (2021ZGSZKC034).

References

- [1] B. Zhang, S.P. Peng, T.Wang. Research on the strategic path and countermeasures of building a coal resources power, Chinese Engineering Science, Vol.21(2019)No.1, p. 88-96.
- [2] G.F. Wang, S.H. Ren, Y.H. Pang. The development effect of the 13th Five-Year Plan and the implementation path of the "dual-carbon" target , Coal Science and Technology, Vol.49(2019)No.9, p. 1-8.
- [3] F. Liu, W.J. Cao, J.M. Zhang. Progress of scientific and technological innovation and the development direction of the 14th Five-year Plan, Coal Journal, Vol.46(2021)No.1, p. 1-15.
- [4] J.X. Tang, J. Liu, Y.Q. Liang. Thoughts on the development of China's coal industry during the 14th Five-Year Plan Period, China Coal, Vol.47(2021)No.10, p. 6-10.
- [5] H.J. Liang, Z.Y. Zhao. Development direction of coal mining technology: Comment on coal mining, Mining Research and Development, Vol.39(2019)No.9, p. 152.
- [6] J.Z. Tao, L. Deng, B.Peng, et al. Application of online learning platform in mining science, Leisure, (2019)No.12, p. 82.
- [7] Z.W. Ding, J.Xiao, R.L.Tang. Teaching research and discussion of mining science under the new normal, China Energy and Environmental Protection, Vol.40(2018)No.2, p. 194-198.
- [8] X.T. Feng, Y.J.Wang. A new direction of mining science development in: Intelligent mining science, Science and Technology Guide, (1995)No.8, p. 20-22.
- [9] D.S. Zhang, S.H. Tu, Z.J.Wan, et al. Construction planning and Progress of Mining Engineering Specialty, China Electric Power Education, (2010)No.27, p. 28-30.
- [10] G.H. Sun, Z.J. Li. Research on the Teaching Reform of the "Mining Science" Curriculum, Education and Careers, (2011)No.2, p. 147-148.