health and safety, environmental laws and the mine standards; we should make the student master the knowledge of professional ethics, obey the principle of professional behavior, be responsible for the job and accomplish their duties with all heart.

Problems and solution of outstanding mining engineering engineer education

Although PETOME has achieved expected results after the practice of several years, as a new teaching model it is faced with some questions and needs to further study and solute. The main problems and solution methods are as following.

It is impossible to make a college student become an outstanding engineer in the four-year undergraduate education, and it needs a longer time, especially the field practice of 4~5 years. Be impatient for educating outstanding mining engineer.

The outstanding engineer is not equal to the chief engineer, and vice versa. The technical director in each department of mine may become an outstanding mining engineer.

The teacher team with "double division of type" should be built. Most teachers in the enterprise have rich engineering experience, but are not good at teaching. Teachers in high school are not good at production, and the engineering experience is relatively poor. So teachers for outstanding mining engineer should be trained by the enterprise and high school, and should become a stable team.

During the period of undergraduate, the excellent student should not have only a year of practice earlier than the common student, but also should be higher than the average student. It is difficult to graduate for students participating PETOME, because they must achieve good scores, good results of science and design, and have excellent capacity and skills.

Conclusion

On the background of the rapid development of mining industry and shortages of high-level mining engineer, by summarizing the experience and shortage in the process of cultivating undergraduate, through discussion by professional teachers, technicians and industry experts, PETOME is made by SDUST and mining enterprises at last. PETOME has clear educating objectives, detail training standards and feasible programs. It takes a firm step for developing outstanding mining engineers. PETOME has been put into practice since 2010 in SDUST, and the initial good results are obtained.

Acknowledgement

This paper is supported by China Natural Science Fund (51104093), 2010 education and teaching research fund "Stars Plan" (qx104004) of SDUST.

References

[1] П. А. Puchkov. Status and future of mining engineer in the world [J]. Foreign Metal Mine, 1997 (1) 4-9.

[2] X.M Lou., Y. Liu, P.M. Huang. Teaching thought and practice about educating and training outstanding mining engineers under Zijin Mode [J]. Chinese Geological Education, 2011 (2) 1-4.

[3] J. Lin. The Development of General Standards for "A Plan for educating and training outstanding engineers" [J]. Higher Engineer Education, 2010(4) 21-29.

[4] A. Zhang, X.F. Liu. Reflection on implementation of "A plan for educating and training outstanding engineers" [J]. Research in Higher Education of Engineering, 2010 (4) 56-59.

[5] Y. Cui. Training mode for excellence engineers based on the discipline characteristics [J]. Meitan Higher Education, 2011 (29) 66-69.