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Individualized Talent Training Mode of Hydraulic and Hydropower Engineering Major Based on Multi-Source Information Fusion Analysis

Shuanglong Li[1,*], Qiaoxiong Chen[2]

[1]School of hydraulic engineering, Nanchang Institute of Technology, Nanchang, 330099, China

[2]Teacher development and service center, Nanchang Institute of Technology, Nanchang, 330099, China

[*]Corresponding author: lsl_7631@163.com

Abstract

The rapid development of information technology, its application in various fields is becoming more and more extensive, especially the general application of multi-source information fusion analysis technology, which has greatly changed the existing education and teaching mode. How to provide accurate services for the setting of refined talent training objectives, curriculum system setting, teaching method innovation, etc. based on multi-source information data and through the fusion analysis, and personalised cultivation of talents is the core issue explored in this paper. The article takes Nanchang Institute of Technology, an applied undergraduate university, as an example to carry out detailed research and analysis of the Hydraulic and Hydropower Engineering Major, and summarises the implementation effect of the model, with a view to providing reference for the subsequent teaching reform ideas.

Keywords

Personalised training; Hydraulic and Hydropower Engineering Major; multi-source information integration; teaching model.

1. Introduction

As China continues to increase the reform of undergraduate education talent cultivation mode, some universities in China have been actively exploring the construction of personalised talent cultivation mode since the 1990s. For example, in 2007, 220 experimental zones for talent cultivation model innovation were approved; in 2009, the Ministry of Education, together with the Ministry of Organisation and the Ministry of Finance, started the implementation of the 'Pilot Plan for Cultivation of Top Students in Basic Disciplines', to build a personalized and distinctive cultivation model [1,2].

The core of multi-source data fusion analysis lies in extracting key and representative effective information from the fusion information data obtained from multi-source channels. This kind of effective information is often used for the research and prediction of talent demand in the professional field, so as to provide valuable references for professional talent training work [3].

2. Analysis of the Current Situation of Personalised Training in Higher Education

At present, the notable problems of personalised training in applied undergraduate colleges and universities are mainly manifested in the following two aspects.

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2.1. Lack of clarity and specificity of training objectives

(i) Unclear objectives: some institutions describe the objectives of personalised talent training in a more general way, lacking clear standards and specific directions. For example, the requirements in terms of knowledge, ability and quality are not detailed enough, which makes it difficult for teachers and students to accurately grasp the key points in the teaching and learning process and affects the cultivation effect [4].

(ii) Lack of characteristics: the personalised talent cultivation objectives between institutions converge, without fully combining the school's own advantageous disciplines, regional characteristics, industry needs and other factors, failing to form the cultivation objectives with the characteristics of their own schools, so that the students cultivated lack of unique competitiveness [5].

2.2. Unreasonable curriculum system

(i) Imbalanced course structure: the ratio of theoretical courses to practical courses is not coordinated, and the practical courses are fewer and less in-depth than the theoretical courses, which leads to insufficient practical ability and application ability of students and makes it difficult to meet the requirements of personalised talent cultivation on practical teaching.

(ii) Outdated course content: the course content is updated slowly, and cannot reflect the cutting-edge dynamics of the discipline and the development needs of the industry in a timely manner. For example, some teaching materials have not been updated for many years, and the teaching cases are outdated, so that there is a gap between the knowledge acquired by the students and the practical application, which can't meet the demand of the society for application-oriented talents.

3. Exploration of Personalised Training Model Based on Multi-source Information Fusion Analysis

3.1. Collection of information from multiple sources

(i) Collection of student information

① Collect basic academic information such as students' academic performance in various subjects, academic performance, and the status of make-up exams and re-studies.

② Collect information on students' interests and hobbies, such as the types of club activities they participate in, the roles they assume in the clubs, and their motivation to participate in the activities, etc., which are obtained through students' self-declaration and school activity records.

(ii) Collection of teaching process information

① Record students' classroom performance during the teaching process, such as attendance, participation in classroom interactions, and completion of homework.

② Collect information on students' online learning behaviours, such as the frequency of logging into the learning platform, the length of online learning, the browsing and downloading of learning resources, and the number and quality of speeches made in the discussion forum.

(iii) Collection of Teacher Evaluation Information

Collect teacher evaluation information on students from teachers such as classroom teachers, counsellors or class teachers, including students' personality and social skills.

3.2. Information fusion analysis and mining

(i) Learning behaviour analysis

By analysing the data of students' online learning behaviours, students' learning habits and learning preferences can be found. For example, some students like to study intensively in the

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evening, while others prefer fragmented learning; some students are highly receptive to video teaching resources, while others prefer reading text materials.

Based on these analyses, schools can provide students with personalised learning suggestions, such as recommending more evening learning resources for students who are accustomed to studying in the evening, and providing more videos of high-quality courses for students who prefer video learning.

(ii) Academic performance prediction

Using information fusion analysis technology, students' historical performance data are mined to establish an academic performance prediction model. By analysing factors such as the trend of students' performance in different courses and the correlation of performance between different courses, it is possible to predict the difficulties students may encounter and the results they may achieve in their subsequent course learning.

For students who may have learning difficulties, schools can intervene in advance, such as providing targeted counselling and adjusting teaching methods, etc.; for students with outstanding performance, more challenging learning tasks and advanced courses can be provided.

3.3. Personalised course design and recommendations

(i) Customised Curriculum System

A personalised course system is designed for students according to their personality, hobbies, career inclination and academic level. For example, for students who have a strong interest in finite element analysis and a certain programming foundation, they can be recommended to study advanced courses such as numerical analysis.

(ii) Interdisciplinary course recommendation

Information fusion technology is used to analyse the correlation between different disciplines and recommend interdisciplinary courses for students. For example, providing architectural aesthetics courses for plumbing students can broaden their professional horizons and employment channels. This kind of interdisciplinary course recommendation can break the traditional disciplinary boundaries and cultivate students' comprehensive application ability and innovative thinking.

3.4. Personalised teaching and learning support

(i) Adjustment of teaching methods

Teachers adjust the teaching methods according to the students' learning styles and classroom performance obtained from the analysis of multi-source information fusion. For students with visual learning styles, more visual teaching content such as images and charts can be added; for students with auditory learning styles, more teaching methods such as explanation and discussion can be used.

(ii) Push Learning Resources

Based on students' learning needs and learning behaviours, the school’s learning management system can automatically push personalized learning resources for students. For example, when a student encounters difficulties in learning a certain knowledge point of a certain course, the system can automatically push relevant learning materials, explanation videos, practice questions, etc. to help students overcome learning difficulties.

3.5. Effectiveness of implementation

Over the past two years, the Hydraulic and Hydropower Engineering Major of Nanchang Institute of Technology has taken the construction of new engineering disciplines as an opportunity to empower personalised talent cultivation based on the fusion analysis of multi-

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source information, which has enhanced certain teaching effects. The implementation effects are summarised as follows:

(i) Stimulate students' learning enthusiasm. The personalised training mode breaks the 'one-size-fits-all' teaching method in traditional education, and is able to customise the learning programme according to students' interests, strengths and career plans.

(ii) Enhance students' comprehensive ability. Through personalised curricula, practical projects and extracurricular extension activities, students' comprehensive qualities such as innovative thinking, teamwork and problem-solving abilities are cultivated in greater depth.

(iii) Promote students' career development. The personalised talent cultivation mode is closely integrated with the needs of the industry and the career development plan of students, so that they can accumulate relevant work experience before graduation and improve their competitiveness in employment, which provides students with more opportunities for career development.

(iv) Creating a speciality of the school. Through the implementation of personalised personnel training mode, the school's Hydraulic and Hydropower Engineering Major to form a more unique teaching and scientific research advantages, to create a more competitive professional characteristics, to attract more students to apply for the profession, and improve the school's popularity and reputation.

4. Concluding Remarks

Taking the talent cultivation mode of the Hydraulic and Hydropower Engineering Major in Nanchang Institute of Technology, an applied undergraduate institution, as a research object, this paper discusses the application of personalised cultivation mode based on the fusion analysis of multi-source information in course teaching. Practice has proved that the change of teaching mode has a positive effect on stimulating students' learning enthusiasm, enhancing students' comprehensive ability and promoting students' career development. In the future teaching reform, the teaching mode can be widely promoted and applied to improve the quality of talent cultivation.

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