Factors Identification and Model Construction of Industry-University Cooperative Education: Based on Analysis of the Application-Oriented Universities

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Abstract. Industry-university cooperative education is an effective educational mode for higher education to cultivate applied innovative talents. This study takes ten application-oriented universities as research objects, and uses content analysis method to identify the key influencing factors in the process of industry-university cooperative education, including operational motivation, operational management, assessment and incentive mechanism. On this basis, this study attempts to build a conceptual model of factors influencing the operational performance of industry-university cooperative education, providing reference for improving the quality of industry-university cooperative education.

Introduction

Co-operative Education program in the modern sense began in 1906, the university of Cincinnati, Ohio. In 2001, the World Association for Cooperative Education changed “Cooperative Education” to “Cooperative & Work - integrated Education (CWIE)”, which covered cooperative education, internship, international exchanges, community service, and other forms combined with work practice, further broadening the range of the concept. Chinese scholars have realized that industry-university cooperative education is an effective education mode to cultivate application-oriented and innovative talents in higher education.

Colleges and universities should choose appropriate cooperative education mode according to the orientation of talent cultivation. Based on the orientation of vocational and job groups, application-oriented undergraduate colleges and universities emphasize the cultivation of vocational ability and professional quality and the improvement of vocational adaptability. Different from the education mode of research universities relying on scientific research projects or platforms, application-oriented universities mainly integrate industry practice into the education through practice bases, order classes, industry colleges and other forms. But because of lacking complete and systematic theoretical and practical guidance, the operational process of cooperative education in many application-oriented universities still exists many problems. The performance is not ideal in the aspects of joint education platform, joint development and construction of teaching resources, joint guidance of students and high quality employment of talents.

Existing studies have proposed the influencing factors of industry-university cooperative education from the aspects of operating environment, motivation, management, guarantee, regulation and assessment from perspective of government, enterprises and universities. However, due to the lack of systematization, the relative importance of the influencing factors cannot be considered. Based on the existing research results, this paper aims to identify and construct model of influencing factors of industry-university cooperative education.
Research Method

This study selected the first 10 pilot applied universities in Zhejiang province as research samples, including Zhejiang University City College, Zhejiang University Ningbo Institute of Technology, Zhejiang Wanli College, Hangzhou Normal University, Zhejiang Shuren University, Ningbo University of Technology, Ningbo University of Finance & Economics, Zhejiang College of Zhejiang University of Technology, Zhejiang University of Finance & Economics Dongfang College, Quzhou University. Interviews were conducted with 22 heads of relevant departments and teachers. The interview time of each teacher was 45 minutes to 90 minutes, and a total of about 30,000 words in Chinese were transcribed.

Content analysis method is adopted to encode and analyze the interview content, so as to identify the key factor influencing industry-university cooperative education. Content analysis is a semi-quantitative and semi-qualitative text analysis method. The research subject of content analysis is various types of texts, including newspaper articles, interview records, picture content, TV programs, memoirs, etc., whose purpose is to clarify or measure the essential facts or trends in the literature.

There are two basic coding methods in content analysis, inductive method and deductive method. The inductive method is the gradual analysis of data to form categories; In the deductive method, the development of the initial category list and code is mainly based on existing theories or previous research results. On this basis, the data are analyzed. With the in-depth analysis, additional codes which were not found in the initial category list are continuously developed, and the initial code is further refined and modified. Although there has been no systematic research on the key influencing factors of cooperative education, the key influencing factors of cooperative education can be extracted through literature summary, which can be used as the initial category of coding. Therefore, this paper follows the logic of deductive method to code.

Factors Identification

Establishment of Categories

Researchers in the field of industry-university cooperative education pay attention to the operational mechanism from the aspects of its operational motivation, operational management, assessment and incentive mechanism. In terms of operational motivation, it is mainly included the internal driving force of complementary interests [1] and the external driving force of legislation and policy support[2]. In terms of the operational management, literature mainly focuses on the institutional framework[3], supporting conditions (funds[4], double-qualified teachers[5], curriculum system based on professional ability [6][7]) and process management(guide, manage and evaluate students)[8]. Some researchers have conducted relevant researches from the aspects of the assessment mechanism [4][5] and the results-based incentive mechanism[9].

Based on the literature review of the key influencing factors of industry-university cooperative education, the basic framework of influencing factors is formed, which is taken as the reference category of influencing factors. The details are shown in table 1:
Table 1. Initial list of key influencing factors

| The primary category               | The secondary category |
|-----------------------------------|------------------------|
| operational motivation (OM1)      | internal driving force (ID) |
|                                   | external driving force (ED) |
| operational management (OM2)      | institutional framework (IF) |
|                                   | supporting conditions (SC) |
|                                   | process management (PM)    |
| assessment and incentive (AI)     | assessment mechanism (AM) |
|                                   | incentive mechanism (IM)   |

Results Analysis

A total of 157 items related to key influencing factors were extracted from the interview data, which were coded according to the secondary category and summarized into the primary category. The specific distribution of each category is shown in Figure 1. Among the key influencing factors of industry-university cooperative education, operational management appear most frequently with 77 items, followed by operational motivation with 62 items. And finally, assessment and incentive with 18 items.

Fig.1 The primary categories distribution

Content Analysis of Operational Motivation Category.

In terms of the category of operational motivation, the internal driving force contains 33 items, and the external driving force contains 29 items. Further refinement of the items reveals that the internal driving force includes complementary interests and transformation of ideas. External driving forces includes legislative constraints, policy support and platform building.

Content Analysis of Operational Management Category.

In terms of the category of operational management, institutional framework contains 20 items, supporting condition contains 36 items, and process management contains 21 items. Institutional framework refers to the top-level design of management organization and institution. The supporting conditions mainly refer to the teaching staff, fund, material and curriculum supporting the industry-university cooperative education, mainly including: (1) the input of funds; (2) attention...
and support from principal; (3) double-qualified teachers; (4) advanced practice and experiment condition; (5) curriculum system based on professional ability. Process management mainly refers to the standardization management during the process of industry-university cooperative education.

**Content Analysis of Assessment and Incentive Mechanism Category.**

In terms of the category of assessment and incentive mechanism, assessment mechanism contains 12 items, incentive mechanism contains 6 items. The number of items under this category is not large compared with the other two categories, mainly because there is no department dedicated to the assessment of industry-university cooperative education, including the government and third-party educational assessment institutions.

Assessment mechanism mainly refers to the assessment carried out by specialized assessment institutions on industry-university cooperative education, and the implementation of policies and rewards according to the assessment results, including both universities and enterprises. Incentive mechanism refers to the government gives rewards to universities and enterprises based on results, and also refers to universities give reward to enterprises in order to encourage enterprises to do their best to instruct students.

**Model Construction**

The results of content analysis of interview data are basically consistent with the initial framework proposed at the beginning. According to the statistics of the frequency of category items, the category of operational motivation contains 62 items, accounting for 39.5%. The operational management category contained 77 items, accounting for 49%; The assessment and incentive category contains 18 items, accounting for 11.5%. In the second category, internal driving force contains 33 items, accounting for 21%; External driving force contained 29 items, accounting for 18.5%; The institutional framework contains 20 items, accounting for 12.7%; The supporting conditions include 36 items, accounting for 22.9%; Process management includes 21 items, accounting for 13.4%; The assessment mechanism contains 12 items, accounting for 7.6%; The incentive mechanism contains 6 items, accounting for 3.8% (as shown in table 2).
Based on the coding and analysis of interview materials of key influencing factors of industry-university cooperative education, we have a certain understanding of key dimensions and influencing factors in the operation of industry-university cooperative education. On this basis, this study attempts to build a conceptual model of key influencing factors of industry-university cooperative education (as shown in Fig.2).
Fig. 2 Conceptual model of factors influencing industry-university cooperative education

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