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Research on Employability Cultivation of Vocational Education in Chinese Eastern Region

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Abstract. China has limitedly encouraged the talent flow, in which the flow of young talents mainly including the university graduates draws many people's attention. But the recent employment of university graduates is not desirable. The key of this problem lies in the ability of university graduates does not meet the demand of units, so it is necessary now to solve the problem of employability of university vocational education. The eastern region of China is a developed area and has the hardware environment to realize this kind of education. This article made a research on 300 students of 18 majors in 11 universities of Yangtze River Delta Region under this background, established an employability model, and verified the efficiency of this model by applying the principal factor analysis and regression analysis. This article applies the employability model to explore the influence route and cultivation way of employability, expecting to provide theoretical basis for employability cultivation of Chinese university students.

Keywords. employability; vocational education; principal factor analysis; regression analysis; cultivation route

1 Introduction

Employability was first defined by employability of workers that had the ability to work. The research of employability was started earlier in foreign countries, for example, the wide range of survey and relatively systematic exploration had been conducted in Germany, Britain, America, Canada, Australia and other developed countries in 1980s and 1990s, while the research on employability by domestic scholars was made later. It is the difference of research on this problem from the developed countries, and the sharp increase of university enrollment for graduates that lay more employment pressures on graduates. Recently, the research on employability in China has been constantly developed, so this article proposed an idea, which is to cultivate the employability in vocational education of Chinese eastern region.

Great contributions have been made recently by relevant domestic scholars for the research on employability cultivation. And it is the academic achievements of these people that gradually reduce the employment pressures on domestic university graduates. Wang Yarong and other people (2014) proposed that, the measurement of satisfaction on developing the employability of university students is necessary to be held in university to guide this practice. The students are the direct beneficiaries of educational service, and the obtainment of employability has a great impact thereon, so the author has constructed a model for satisfaction on developing the employability of university students based on ACSI and CHE-CAI models, as well as formed a satisfaction index system[1] applicable to domestic universities and that can be further specialized. Zhang Jiaolin (2014) started with concept of employability for university students, sorted the types and compositions of employability, and thought that the employability in market economy has relativity and variability, and the improvement of employability for university students shall be realized by reforming the higher education modes, promoting study-research integration, practical education leading the vocational education and vocational career planning, and school culture propelling the non-vocational skills improvement[2]. Wang Zhigang and other people (2013) proposed that the improvement of employability for university students is the key to settle the "employment gap" between the university students and society, as well as the important way to promote the employment of university students. He made an analysis on structural, technical and system routes to improve the employability of university students based on the perspective of cultivation on professional practical ability.

This article made a research on 300 students of 18 majors in 11 universities of typical Yangtze River Delta Region in Chinese eastern region based the research made by predecessors, expecting to explore the employa-

bility model and the route for cultivating the employability in vocational education.

2 Overview of demand on employability from the employing units

The factors that impact the university graduates may be divided into two aspects, one of which is the graduate himself, and the other the demand of employing units. There are also two developing routes for university graduates, one of which is to further the study, and the other being the employment. But they shall also face the employment problem after further study, so this article has made a research on the employment cultivation in vocational education in Chinese eastern region, thus not involving the self-employment for graduates.

The external factors that impact the employability of university graduates are the social support systems, such as policy, economic system, the variation in labor market, opportunity, family, school, social organization and information support system. While the internal factor refers to the competent quality of university students and the competent quality refers to the deep features to distinguish the excellent worker in a working position from the regular ones.

The experts of human resources management generally divide the competence in to six levels, namely the skill, knowledge, social role, self-concept, feature and motive. Thus, there is a model of impact factors for successful employment of Chinese university students shown in Figure 1.

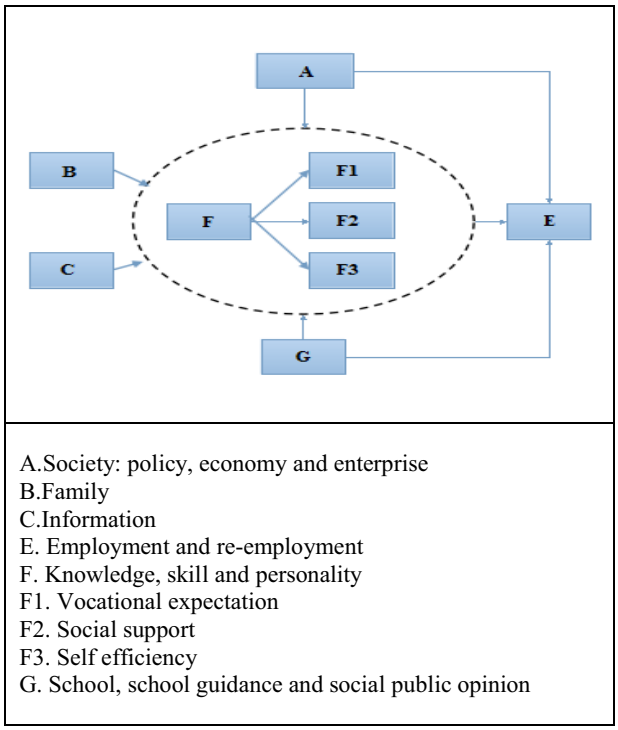


Figure 1. Model of impact factors for successful employment of Chinese university students.

Zhong Yibiao (2006) made an analysis on the empirical data feedback from over 500 employing units and obtained the consideration factors as the employing unit recruited the graduates[4], as shown in Table 1.

Table 1. Consideration factors as the employing unit recruited the graduates (%) [4]

Importance degree	Options	First factor	Second factor	Third factor	Mentioning rate (in total)
1	Professional and basic knowledge	33	19.7	11.7	64.4
2	Correct and positive working attitude	19.8	19.5	12.6	51.9
3	Moral cultivation	16.6	15.2	8.5	40.3
4	Responsibility	9.5	16	13.7	39.2
5	Teamwork spirit	1.5	4.3	15	20.8
6	Reputation of graduated school	8.6	4.6	3.7	16.9
7	Diligent and practical spirit	3.4	4.6	7.2	15.2
8	Social adaptation ability	2.6	3.9	8.5	15
9	Constant study ability	2.8	4.6	7.4	14.8
10	Innovative spirit	0.9	2	5.6	8.5
11	Practical manipulative ability	0.4	1.5	2.6	4.5
12	Organization and management ability	0.7	2.6	1.1	4.4
13	Interpersonal interaction ability	0.2	1.3	2.2	3.7

Data source: Investigation on assessment of university graduates in 2005.

As known from Table 1, if the 13 factors are hierarchically divided according to mentioning rate, the first hierarchy mainly includes professional and basic knowledge, correct and positive working attitude, moral cultivation and responsibility, with the mentioning rate around 40%; The second hierarchy mainly includes teamwork spirit, reputation of graduated school, diligent and practical spirit, social adaptation ability and constant study ability, with the mentioning rate around 15%; The mentioning rate of third hierarchy is around 5%, mainly including innovative spirit, practical manipulative ability, organization and management ability, and the interpersonal interaction ability.

Seen from the statistic result of Zhong Yibiao, the professional and basic knowledge is the most important factor and the second most important factor to be considered as the employing unit recruits the graduates, all ranking the first. While the correct working attitude, responsibility and other factors are also focused on by the employing units. Therefore, the working attitude, their responsibility and moral cultivation after mastering the basic professional knowledge are also the important consideration factors for employing units. The research of this article is started thereafter, mainly discussing the components that impact the employability of university graduates and the relevant cultivation strategies, expect-

ing to provide a reference for vocational education in Chinese developed eastern regions to impact the employability of students.

3 The theoretical basis for conception and analysis method of students' employability model

The important problem that this article researches is the model of employability for university students, as the construction of employability model is conducive to the pre-established model shall be based on the model conception before verifying its model. However, the proper degree of model verification method is also a key point to affect the model. So this chapter provides a theoretical basis for principal factor analysis and regression analysis based on analysis of model conception.

3.1 Conception of employability model

This article made an analysis on the micro employability of university student individuals, which can be divided into hardware and software ability, and was summarized into hardware and software ability through the references and investigation report of employment situation and development of university students in 2013.

Hardware ability: refers to qualities of knowledge, experience, skills, etc. that are easy to be assessed. The employing unit will assess it based on reputation, grade of graduated schools, and various ability certificates.

Software ability: refers to qualities of innovation, teamwork spirit, character features, etc. that are hard to be assessed but very important. The employing unit will assess it based on exchange with graduates, interviews and other routes.

This article made an analysis based on the data provided in the Investigation Report of Employment Situation and Development of University Students in 2013 issued by Chinese Human Resources Development Network, which respectively provides the graduates employability selected by enterprises, graduates and university students, as shown in Table 2 arranged by the author.

Table 2. Schedule of investigation result of graduates qualities and abilities that the enterprises, graduates and university students mostly focus on.

Qualities and abilities	Enterprises on graduates		Graduates on graduates		University students on graduates	
	Proportion of selection	Order	Proportion of selection	Order	Proportion of selection	Order
Adaptation ability	47.12 %	1	41.42 %	3	35.71 %	3
Professional level	46.72 %	2	49.23 %	1	56.60 %	1
Ideology and morality	35.79 %	3	14.50 %	6	17.42 %	5
Communication ability	34.59 %	4	43.24 %	2	45.89 %	2
Mental quality	30.42 %	5	32.64 %	4	29.76 %	4
Organization ability	4.37 %	6	15.76 %	5	11.15 %	6
Other ability	0.99 %	7	0.98 %	7	1.73 %	7

As known from the date in Table 2, all the enterprises, graduates and university students focus on the professional level, and most of the university students, not long after their admission, will be prepared to pass the CET 4, CET 6, TOEFL, GRE and computer certificate, from which we can see that the professional level is important, and the concentration degree thereof is also known to everyone. So, for the employment guidance department in the university, the ability of employment guidance to improve the level of students is no more obvious, namely the professional level is no longer the focus of employment guidance education or improvement of employability. Compared to software strength, the adaptation ability that the enterprises focus mostly on shall require the concentrated education of employment guidance. Therefore, the improvement of professional level is not within the research scope of this article, which will mainly analyze the remaining five factors to construct the model of students employability. The key to construct the employability model is to abstract the assessment index of employability. This article adopts principal factor analysis method, by which the key index will be obtained and shall be comprehensively verified. This article adopts the regression analysis method for verification, aiming at the employability satisfaction.

3.2 Theoretical basis of principal factor analysis

The factors related to research purpose mostly in the process of problem research, which will be divided into common and sole factors according to the classes. The former refers to the common factors shared by each original variable, which may explain the interrelation of each variable. The latter refers to the exclusive factor in the original variable that cannot be explained by common factor. The factor load represented by application of inter relation of common factors in the analysis of original variable and factors. The often used model expression of factor analysis is shown in Formula (1).

$$Z_j = a_{j1}F_1 + a_{j2}F_2 + \cdots + a_{jm}F_m + U_j \left(j = 1,2,\cdots,n\right) (1)$$

In Formula (1), Z_j refers to the standardized score of j th variable, F_i referring to common factor, m referring to the number of common factor of all the variables, U_j referring to the sole factor of variable Z_j, and a_{ji} referring to negative load of factor.

The factors in Formula (1) can be construed as m coordinate axes mutually perpendicular in the high-dimension space. a_{ji} is called the factor load, namely the load of j th original variable in the i th factor. If the vari-

able Z_j is considered as the standardized regression factor in m -dimension factor space, U will be called the special factor, representing the part that cannot be explained by factors in original factor, with average value 0. So U can be considered as the residual in the multiple linear regression model.

The purpose of factor analysis is to concentrate the original variable and abstract the core variable. If the factor analysis is expected, we shall first determine whether the observed data is applicable to factor analysis, then abstract the common factor to be used for calculation of factor score of individual sample.

3.3 Theoretical basis of regression analysis

In the actual problem, the factor that affects one matter is not only one, and the affecting factor is not in linear relation with the development trend of matters. So we shall find out the functional relations between the factor and matter, for which the multiple linear relation is an excellent method. If the random variable y is related to $p(p \geq 2)$ regular variable $x_1, x_2, x_3, \cdots, x_p$, and meet the Formula (2), the Formula (2) will be called as the mathematics description method of multiple linear regression.

$$\begin{cases} y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \cdots + \beta_p x_p + \varepsilon \\ E(\varepsilon) = 0, Var(\varepsilon) = \delta^2 < +\infty \end{cases} \quad (2)$$

Among which, $\beta_0, \beta_1, \beta_2, \beta_3, \cdots, \beta_p, \delta^2$ is an unknown parameter non-related to $x_1, x_2, x_3, \cdots, x_p$, and ε is a random variable that cannot be observed. Formula (2) is called as p -dimension theoretical linear regression model, with $\beta_0, \beta_1, \beta_2, \beta_3, \cdots, \beta_p$ called as regression factor, and $x_1, x_2, x_3, \cdots, x_p$ as the regression factor or design factor, factor $\beta_i (i = 1,2,3,\cdots, p)$ in short. It reflects the impact of factor $x_i (i = 1,2,3,\cdots, p)$ on observed value y, so $\beta_i (i = 1,2,3,\cdots, p)$ is also called as the effect of factor $x_i (i = 1,2,3,\cdots, p)$.

Apply the least square method to solve the evaluation vector $\hat{\beta}$ in the column vector β of regression factor in Model (2), and the error sum square of regression factor is as shown in Formula (3).

$$Q(\beta_0, \beta_1, \beta_2, \cdots, \beta_p) = \sum_{i=1}^{n} (y_i - \beta_0 - \beta_1 x_{i1} - \beta_0 x_{i2} - \cdots - \beta_p x_{ip})^2 \quad (3)$$

According to the ideology of least square method, namely the abstraction of group with least error sum square as the parameter evaluation of regression factor, which means if $\hat{\beta}_0, \hat{\beta}_1, \hat{\beta}_2, \cdots, \hat{\beta}_p$ exists and makes it meet the Formula (4).

$$Q(\hat{\beta}_0, \hat{\beta}_1, \hat{\beta}_2, \cdots, \hat{\beta}_p) = \min\{Q(\beta_0, \beta_1, \beta_2, \cdots, \beta_p)\} \quad (4)$$

$\hat{\beta}_0, \hat{\beta}_1, \hat{\beta}_2, \cdots, \hat{\beta}_p$ will be called as the least square evaluation of parameter $\beta_0, \beta_1, \beta_2, \cdots, \beta_p$.

4. Empirical analysis

4.1 Research object

The research object is the 300 students of 18 majors in 11 universities of typical Yangtze River Delta Region, including four grades in the university, grade 1 and 2 of postgraduates, among which the interviewed man students were mainly the current year's graduates and students in each grade, and given by questionnaires. The returning rate of questionnaire was 96.7%, as shown in the questionnaire frequency according to grades and professions.

Table 3. Schedule of questionnaire frequency according to grades and professions.

Categorization	Valid	Frequency	Percent	Valid Percent	Cumulative Percent
According to grades Categorization	Freshman	70	24.1%	24.1%	24.1%
	Sophomore	30	10.3%	10.3%	34.5%
	Junior	80	27.6%	27.6%	62.1%
	Senior	10	03.4%	03.4%	65.5%
	Grade 1 of postgraduate	90	31.0%	31.0%	96.6%
	Grade 2 of postgraduate	10	03.4%	03.4%	100.0%
	Total	290	100.0%	100.0%	/
According to professions Categorization	Finance	10	3.4%	3.4%	3.4%
	Material science and engineering	10	3.4%	3.4%	6.9%
	Material science	10	3.4%	3.4%	10.3%
	Electric engineering	20	6.9%	6.9%	17.2%
	Thermal and power engineering	10	3.4%	3.4%	20.7%
	International Shipping	20	6.9%	6.9%	27.6%
	Management science and engineering	10	3.4%	3.4%	31.0%
	Environmental engineering	10	3.4%	3.4%	34.5%
	Artistic design	10	3.4%	3.4%	37.9%
	Electric information	70	24.1%	24.1%	62.1%
	Measurement technology and instrument	10	3.4%	3.4%	65.5%
	International trade	10	3.4%	3.4%	69.0%

Power machinery and engineering	10	3.4%	3.4%	72.4%
Control theory and control engineering	40	13.8%	13.8%	86.2%
Electromagnetic field and microwave technology	10	3.4%	3.4%	89.7%
Pharmacy	10	3.4%	3.4%	93.1%
Utility management	10	3.4%	3.4%	96.6%
Computer science and technology	10	3.4%	3.4%	100.0%
Total	290	100.0	100.0	/

4.2 Result of principal factor analysis

This article used SPSS19.0 software to carry out the varimax rotation of main components to questionnaire of research object, and obtained the exploratory factor analysis result. After removing some items with obvious crosses and interference, the rest are the 20 items shown in Table 4, which were subdivided into four principal factors by cluster analysis of software, namely principal factor 1- employment ability, principal factor 2- teamwork ability, principal factor 3- innovative ability and principal factor 4- personality features. Result of principal factor analysis, as shown in Table 4.

Table 4. Schedule of result of principal factor analysis.

Symbol	Content of item	Principal factor 1-F1	Principal factor 2-F2	Principal factor 3-F3	Principal factor 4-F4
x1	Familiarize the employment procedure	0.894			
x2	Write a job application letter	0.829			
x3	Response technique	0.781			
x4	Prepare a resume	0.779			
x5	Employment test	0.738			
x6	Interview technique	0.662			
x7	Collect information	0.654			
x8	Employment trend	0.607			
x9	Clarify the plan	0.601			
x10	Relatively optimistic		0.846		
x11	Good at interaction		0.816		
x12	Communication ability		0.675		
x13	Teamwork		0.493		
x14	Adaptation ability			0.851	
x15	Innovative ability			0.768	
x16	Adaptation to environment			0.656	
x17	Quick reaction				0.707
x18	Fast comprehension				0.622
x19	Aggression				0.610
x20	Responsibility				0.607
α factor		0.879	0.842	0.773	0.820

It is concluded from the data in Table 4 that:

1) The general variance explanations of four principal factors are all over 60%, and the reliability index of consistency among the item of each factor is very desirable.

2) The function relation of four principal factors and the corresponding items are as shown in Formula (5).

$$\begin{cases} F_1 = 0.894x_1 + 0.829x_2 + 0.781x_3 + 0.779x_4 + \\ \quad + 0.738x_5 + 0.662x_6 + 0.654x_7 + 0.607x_8 + 0.601x_9 \\ F_2 = 0.846x_{10} + 0.816x_{11} + 0.675x_{12} + 0.493x_{13} \\ F_3 = 0.851x_{14} + 0.768x_{15} + 0.656x_{16} \\ F_4 = 0.707x_{17} + 0.622x_{18} + 0.610x_{19} + 0.607x_{20} \end{cases} \quad (5)$$

4.3 Result of regression analysis

The measurement of professional employment effect shall be verified in the macro manner. This article thought that the micro-level employability index is in close relation with the satisfaction of student employment and the salary standard, among which the employment satisfaction is a subjective index, while the salary level is an objective index. The initial salary level can be obtained based on the employment index of 4461 students of 18 majors in 11 universities in Yangtze River Delta Region that have signed employment agreements. In this Table, the salary is calculated in the annual salary manner, and it indicates that, the number of initially employed graduates with salary level lower than 50 thousand yuan accounted for 47.2% of total graduates, while the ones with annual salary over 100 thousand yuan only accounted for 4.9%.

The Table 6 indicates the satisfaction investigation result of the graduates that have signed the employment agreement. In this Table, the satisfaction is divided into 5 degrees, respectively very unsatisfied, unsatisfied, no complaint, satisfied, very satisfied. As shown in the result of the Table, 71.0% of graduates that have signed the employment agreement are satisfied or very satisfied, while there are also 2.8% of graduates that have signed

the employment agreement are unsatisfied or very unsatisfied.

Table 5. Schedule of investigation result of salary level.

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
≥ 5 10 thousand	2105	47.2%	47.2%	47.2%
> 5 10 thousand ≤ 10	2138	47.9%	47.9%	95.1%
> 10 10 thousand	217	4.9%	4.9%	100.0%
Missing System	1	0.0%	0.0%	/
Total	4460	100.0%	100.0%	

Table 6. Schedule of investigation result of satisfaction on works that have been signed with agreements.

Valid	Frequency	Percent	Valid Percent	Cumulative Percent
Very unsatisfied	18	0.4%	0.4%	0.4%
Unsatisfied	108	2.4%	2.4%	2.8%
No complaint	1169	26.2%	26.2%	29.0%
Satisfied	2421	54.3%	54.3%	83.3%
Very satisfied	745	16.7%	16.7%	100.0%
Total	4460	100.0%	100.0%	

This article made a regression analysis on four principal factors by taking the employment satisfaction as the dependent variables, with the analysis result shown in Table 7.

Table 7. Schedule of regression analysis result of principal factors by taking the employment satisfaction as the dependent variables.

Variable	Employment ability	Teamwork ability	Innovative ability	Personality features	Goodness of fit	Finspection
Employment satisfaction	0.071	0.117*	0.154**	0.151**	0.131	4.122
Note: * indicates P<0.1, ** indicates P<0.05, and *** indicates P<0.01						

It is concluded from the regression analysis data in Table 7 that:

1) In consideration of impact of four principal factors on employment satisfaction, the teamwork ability, innovative ability and personality features have significant contributions, while the employment ability contribution on satisfaction is not obvious.

2) As shown in the comprehensive regression analysis result, the employment ability also has a certain contribution, by which the route structure of employment ability, employment guidance and practical employment will be obtained.

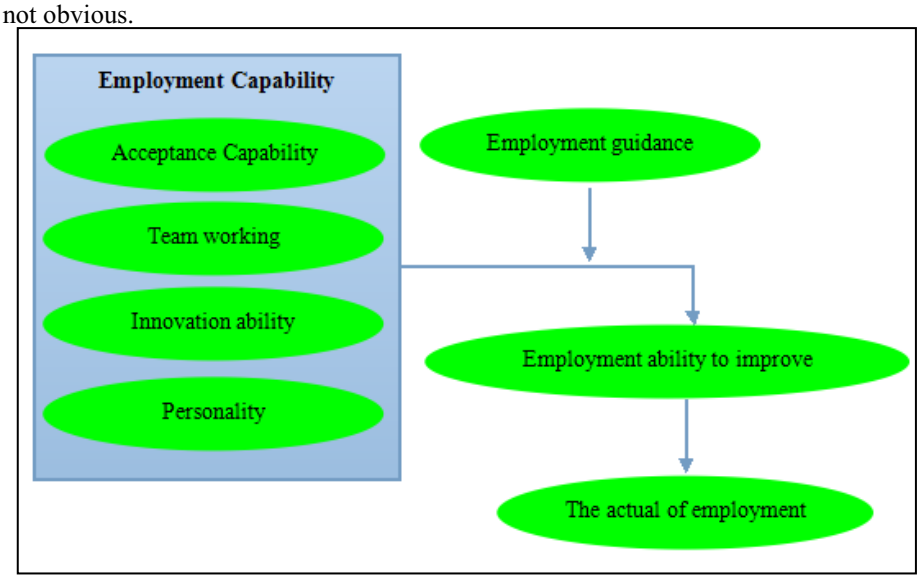


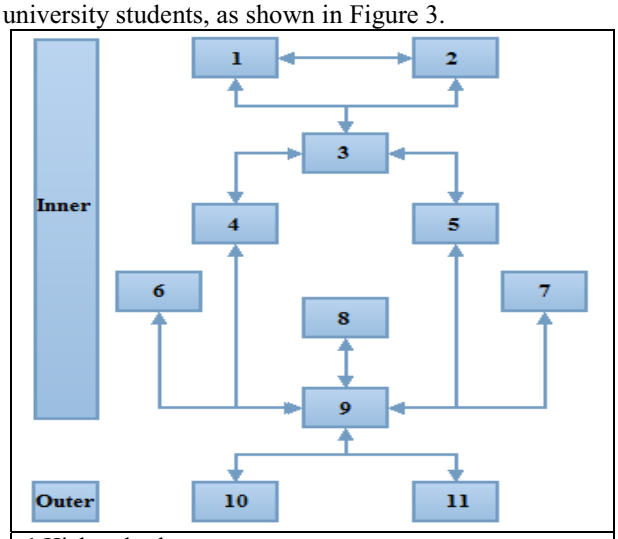
Figure 2. Diagram of route structure of employment ability, employment guidance and practical employment.

4.4 Route for cultivation of employability

Improve the employability of students by university vocational education, and all the channels can be divided into internal and external factors, among which the internal factors include the friends in schools, student vocational development association, university employment guidance center, teachers or tutors, classmates, college employment center, student guidance committee and highest leader. The external factors include external experts and major member of family. Either the internal or

external factors will finally impact the students themselves.

So there are channels that affect the employability of university students, as shown in Figure 3.



1.Highest leader
2.Student work guidance committee
3.University employment guidance center
4.Student vocational development association
5.College employment center
6.Friends
7.Classmates
8.Teachers or tutors
9.Students themselves
10.External experts
11.Major members of family

Figure 3. Diagram of channels that affect the employability of university students.

The Employability Cultivation of Vocational Education in Chinese Eastern Region is shown as follows:

1) In the cultivation of employability for students, the impact of politics and professional courses on education of ideology and politics of students shall be considered.

2) Integrate the actual conditions in each regions and universities, combine the relevant resources, strengthen the teacher and scientific research power, and set up the compulsory or optional courses of employability for university students as soon as possible[5].

3) Systematically develop the cultivation of employment ability, teamwork ability, innovative ability and personality features, systematically and scientifically carry out the professional career planning education for students, positively invite the experts, entrepreneurs, scientists, alumnus to school to hold face-to-face lectures about formulation of professional goal and education of professional quality education.

4) Reinforce the management, investment and construction of professional practical education, facilitate the reform of education system, promote the reform of course system, adopt the measure of "exploring while doing practice", "experimenting while promoting" to facilitate the development of this field in Chinese eastern region.

5 Conclusion

This article starts with demand of employing unit on employability to make an analysis on the demand of employing unit on the graduates' ability. This article also made an analysis on the investigation result of abilities of graduates, graduates to graduates, university students to graduates that the enterprises mostly focus on based on the demand of employing unit on the graduates ability, and obtained the conception of employability model of other quality abilities that ignore the professional level, as well as provided a principal factor analysis and regression analysis theory of model verification. Finally, it applied the principal factor analysis method to obtain four principal factors that affect the employability, respectively the employability factor, teamwork ability factor, innovative ability factor and personality feature factor, and used regression analysis method to verify the impact and contribution of four principal factors on the job satisfaction, by which it concluded that the teamwork ability factor, innovative ability factor and personality feature factor have significant contributions to satisfaction.

Finally, it provided the route for employability cultivation of the vocational education in Chinese eastern region, expecting to provide a guidance and reference for improvement of employability for university students, as well as for laying a theoretical foundation for development of experimental units in eastern region.

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