

Research on Process-Based Comprehensive Testing Method for Private Artistic College Teachers

Hongqiang Ma, Jiayu Shao, Baojin Fang

Shanghai Institute of Visual Arts, Shanghai, 201620, China

Keywords: High School Teachers, Talented Test, Performance Appraisal

Abstract: Development Model of College School Teachers Revealed the Rules of All teachers' Career Progress[1,2,3]. Researching on Methods to Processing a Scientific and Comprehensive Talented Test for Teachers Based on Rules Should Be a Significantly Meaningful Work. This Paper Carries on a Comprehensive Scientific Evaluation of Private Art Teachers in Colleges and Universities by Expounding the Process-Based Comprehensive Evaluation Methods of Private Art Teachers in There, and Records the Career Development Process of Private Art College Teachers to Conduct Talent Evaluation for Private Art College Teachers. Provide a Realistic Basis and Verify the Scientific Nature of the Idea through Mathematical Models.

1. Introduction

Competence and Quality of College School Teachers Directly Related to Training Talents, and Also is an Important Part in Expressing Competitive Power of High School. Therefore, Figuring out a More Sophisticated and More Scientific Approach to Evaluate Talents in College Strongly Stick to Reality. in Recent Years, Kpi Performance Appraisal, Bsc, Targets Performance Appraisal Have Been Tremendously Adopted by Universities[4,5], However, These Methods Are Not Effective Enough to Solve All Evaluation Problems during the Process of Development of teachers' Career.

Aojing[6] Focused on Researching Processing Management and in Result, the Administrative System Has Been Optimized by This First-Class Process. Liao Xiaohui[7] Has Been the Greatest Contributor in Building Up a Evaluation and Indicator System of Artistic College Performance Appraisal. Eventually, a Comprehensive Testing Method Which Suitable for All Private College Teachers Can Be a Real Thing by Researching Process-Tracked Way as Well as Mature Kpi and Bsc Testing Approach Based on Processing Management Method.

This Paper Explores the Construction of a Comprehensive Evaluation System for Process-Driven Private Art College Teachers. the Article is Divided into Five Parts. the First Part Introduces the Process-Based Tracking Method of Sophisticated Examination of Career Development for Artistic College Teachers; the Second Part Introduces the Cycle Theory of College teachers' Career Development; the Third Part Initially Establishes the Comprehensive Assessment Management Platform of College teachers' Career Development; the Fourth Part is about the Design of the Principal Component Analysis Method for the Comprehensive Evaluation of Teachers in Private Art Colleges; the Fifth Part Expounds the Significance and Shortcomings of This Method.

2. Introduction of Development Method of Processing Tracking Career for Private Artistic College Teachers

William h. Bergquist and Steven r. Phillips Presented the First Type of University Teacher Development Model in the Article "Components of Effective University Teacher Development Project" in 1975. It Believes That the Development of University Teachers is Consist of Three Related Modules, Which Includes Improvements on Teaching(Process), Improvements on Organization (Structure) and Personal Development (Attitude) [10]. Jerry Gaff Defines the Development of University Teachers in the Book Faculty Renewal, Published in 1975: University Teacher Development is a Process of "Enhancing Ability, Expanding Interest, and Being Competent in Work to Promote Professional and Personal Development of Teachers". Jerry Gaff's University

Teacher Development Model Focuses on Subject and Curriculum Design, and Believes That the Three Parts of Berg West's University Teacher Development Model Can Be Developed Independently. in 1977, Bergwest and Phillips Published the “Development Handbook of University Teacher”, Which Revisited Several Important Theoretical Models and Revised and Supplemented the First Model, Which Led to a New Ideal Model in a Boarder Discipline Background. [11]

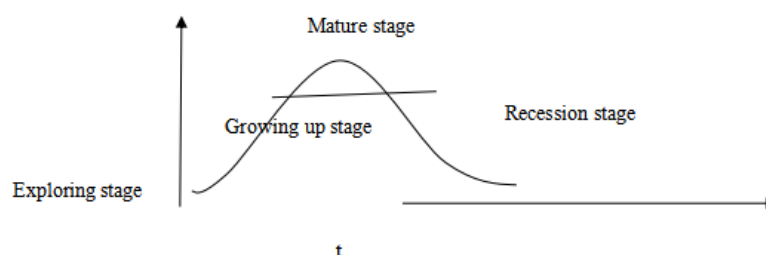
Building Up Modernized Professional Development Tracking Platform of Comprehensive Test According with Professional Development Trajectory of Teachers; Construing Indicator System of Both teachers' Career Development and Comprehensive Test, and Also Making It Possible to Express teachers' Professional Curve Base on Its Process. the Process-Driven Comprehensive Assessment Can Not Only Reflect the Career Development Trajectory, But Present the Career Development Performance, as Not Being the Result-Oriented Performance Evaluation Model, and Also Focusing on the Work Quality Management of the Process, a Comprehensive Assessment is Arranged Based on Teacher's Actual Work Process Tracking and Qualitative Evaluation.

3. The Theory of Career Development Cycle of Private Art College Teachers

Representative Theory in Teaching Development Pattern Includes: Pre-Employment Attention Stage Theory; Occupational Cycle Theory; Career Cycle Dynamic Theory; Career Cycle Subject Theory. Some Scholars Use the Theory of Hughman's Career Cycle Subject to Divide the Development of College Teachers into Four Stages: the Induction Stage (1~2 Years of Entry), the Rapid Growth Stage (3~5 Years of Entry), and Mature Development. Stage (6~15 Years), Plateau or Transcendence Stage (Joining for More Than 15 Years). [12]

Representative achievements that Chinese scholars in research of stage theory for professional development of liberal arts teacher: seven-stage theory of Jia ronggu, six-stage theory of Zhou jingkun and five-stage theory of Lu ye: pre-employment stage, induction stage, improvements stage, mature stage and famous stage. All above scholars have been considering things by standing on their own career and personal development to express how important the teachers' career development is to them.[13]

Combined with Hubertman's principle part theory of occupational cycle and college teachers' development stage theory based on career development circumstance of artistic college teachers, we divided occupational development curve of artistic college teachers into four stages: exploring stage, growing up stage, mature stage and recession stage, chart as follows:

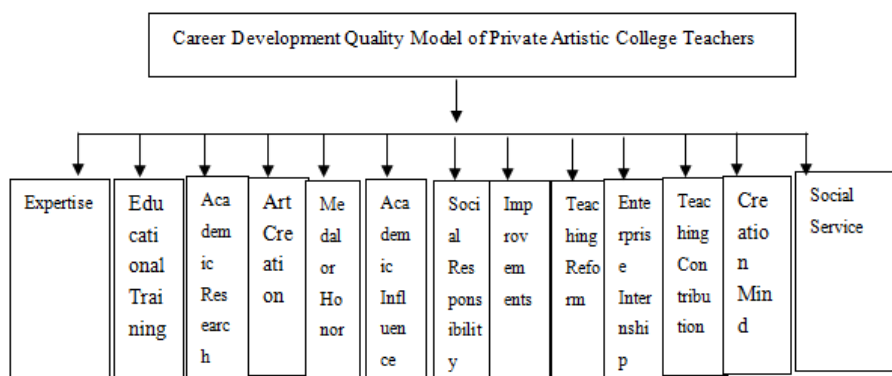


We can receive the message from the occupational development curve of private artistic college teachers that the precious and middle stage of teachers' development stands for the key factor to those teachers in artistic college. Stick to the discipline of professional teachers development of artistic college, especially focusing on arrange and improve professionalization in precious and middle stage of career contain instruction meaning.

4. Establishment of Comprehensive Evaluation Management Platform of College teachers' Career Development

David McClelland, professor of Harvard University, has came up with theory of 'Capability' for

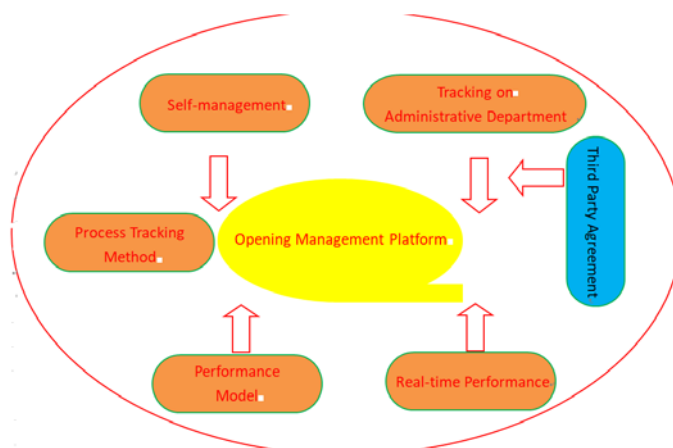
the first time. He believes that ‘Capability’ refers to a profound character which used for separating excellent and normal people in work[14]. Besides, based on statistic data, the occupational development process of artistic college teachers still exist professional ‘Capability’ model, and it is capable to summarize the principal aspects that affects teachers’ career according to the main proportion analyse method. Therefore, as it seeks to establish comprehensive testing arrangement platform, especially make it possible to evaluate teachers based on occupational development discipline, and more importantly, it should be able to reflect teachers’ competence and quality in all round during the occupational development process of private artistic teachers, we need to build up a career development quality model of private artistic college teachers first (P1) :



P1: Career Development Quality Model of College Teachers

According to the career development quality model of private art college teachers, a comprehensive evaluation system management platform based on the professional development quality model of private art college teachers is established. The comprehensive assessment management system takes the professional development quality model of private art college teachers as the basis of process data. On the basis of collecting data, a comprehensive assessment model is established to visually present the comprehensive assessment results. The result presentation can be in a certain period, at a certain stage, or in the whole career development process. It can also compare individual longitudinal performance or perform horizontal comparison of performance between different talents. To provide an objective image of decision-making basis for selecting talents, educating talents and using talents.

Based on the process tracking method, the construction of the comprehensive assessment management system for teachers of private art colleges (as shown in Picture 2), and based on the data collection of the college teachers' career development quality model, we have established a comprehensive assessment model, and on the recorded data, performance analysis is completed. In the statistical way, the system can describe the basic conditions for the career development of private art teachers and provide a strong evidence for their professional development.



P2: Comprehensive testing management platform for private artistic college teachers

5. Design of Principal Proportion Analyse Method of Comprehensive Testing Comment for Private Artistic College Teachers

5.1 Establish an Evaluation Matrix

When assessing and evaluating the teachers of private art colleges, we can set the assessment index of a teacher as a multi-dimensional vector (x_1, x_2, \dots, x_n) , and set the assessment data of m teachers of a certain unit into a m-row n-column matrix. The career development data is weighted and compared. After statistical summary of the data, the evaluation matrix of the m-teacher's evaluation is:

$$X = \begin{bmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{bmatrix} \quad (1)$$

x_{ij} represents comment score of i teacher under j comment indicator.

5.2 Calculating the Correlation Coefficient Matrix

Calculating the correlation coefficient matrix in order to reduce the dimension of the teacher evaluation index matrix, the i-th column data of the m-teacher's evaluation matrix X is recorded as a vector $X_i = (x_{i1}, x_{i2}, \dots, x_{in})^T$, then the mean value of the vector is calculated as $\bar{X}_i = \frac{1}{n} \sum_{k=1}^n x_{ki}$, and the data under the i-th evaluation index and the j-th evaluation index are calculated. Correlation coefficient of data:

$$r_{ij} = \frac{\sum_1^m (x_{ki} - \bar{X}_i)(x_{kj} - \bar{X}_j)}{\sqrt{\sum_1^m (x_{ki} - \bar{X}_i)^2} \sqrt{\sum_1^m (x_{kj} - \bar{X}_j)^2}} \quad (2)$$

Where $i, j=1, 2, 3, \dots, m$

The correlation coefficient matrix between the n evaluation indicators is obtained by the correlation coefficient calculation function $R = (r_{ij})_{n \times n}$. The elements in the correlation coefficient matrix reflect the correlation between the data under the i-th evaluation index and the data under the j-th evaluation index.

5.3 Calculate the Feature Score and Select the Principal Component

Correlation matrix between the data under the i-th evaluation indicator and the data under the j-th evaluation index $R = (r_{ij})_{n \times n}$, select the corresponding principal component by calculating the feature score of the correlation matrix. The feature score λ_i of corresponding matrix $R = (r_{ij})_{n \times n}$ and corresponding feature vector $\zeta_i = (\zeta_{i1}, \zeta_{i2}, \dots, \zeta_{in})^T$, by the way, suits for $\lambda_1 > \lambda_2 > \dots > \lambda_i \geq 0$ is generally, the principal component with a higher cumulative contribution rate is selected as the final determined principal component, and the number of selections is appropriately selected according to needs, which is assuming that P principal components are selected. The cumulative contribution rate calculation formula is:

$$\eta_p = \sum_1^p \lambda_k / \sum_1^n \lambda_k \quad (3)$$

5.4 Dimension Reduction of the Evaluation Matrix

After selecting the research object, it is necessary to reduce the dimension of the evaluation matrix, that is, perform linear transformation to reduce the dimension of the evaluation information matrix.

The linear transformation is shown in the following formula:

$$Y = \begin{bmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{bmatrix} \times \begin{bmatrix} \zeta_{11} & \cdots & \zeta_{p1} \\ \vdots & \ddots & \vdots \\ \zeta_{1n} & \cdots & \zeta_{pn} \end{bmatrix} = \begin{bmatrix} y_{11} & \cdots & y_{1p} \\ \vdots & \ddots & \vdots \\ y_{m1} & \cdots & y_{mp} \end{bmatrix} \quad (4)$$

$$y_{ij} = \sum_{k=1}^n x_{ik} \zeta_{kj}, i, j = 1, 2, 3, \dots, n.$$

By the linear transformation, the original nine evaluation indexes are converted into p evaluation indexes including the original evaluation information by the dimensionality reduction processing, thereby effectively reducing the number of evaluation indexes and reducing the computational complexity.

5.5 Design of Comprehensive Evaluation Model for Teachers of Private Artistic Colleges

According to the previously determined evaluation index system of college teachers' career development, the evaluation model of college teachers' career development is constructed:

$$F = \sum_1^p L_i F_i \quad F_i = \sum_1^n X_k W_k; (i=1,2,3, \dots, p; k=1,2,3, \dots, n) \quad (5)$$

Indicates the final score of the candidate's competency evaluation, L_i is the proportion of the variance contribution rate, X_k indicating the main component score of each evaluation, W_k indicating the proportion of the main component.

6. Outlook

Applying this evaluation model system to the professional development model for comprehensive assessment of talents and objectively presenting the professional ability requirements of private art college teachers, also to achieve the scientific development of private art college teachers' performance assessment, has a certain application prospect. However, it has not been fully tested in practice, and there is no case data for the application of principal component analysis.

(MA Hongqiang (1979 -), male, Han nationality, born in Heze, Shandong Province, master's degree, assistant researcher, Shanghai Institute of Visual Arts. Research direction: stochastic differential equation, human resource management, Shanghai, 201620; Shao Jiayu (1983 -), female, Han nationality, Shanghai native, master's degree, associate professor, Shanghai Institute of Visual Arts. Research direction: industrial economy; Fang Baojin (1983 -), male, Han nationality, born in Linyi, Shandong Province, master's degree, associate researcher, Shanghai Institute of Visual Arts. Research direction: information resource construction and analysis)

References

- [1] Bergquist W.H. & S R.Phillips.Components of an Effective Faculty Development Program[J].The Journal of Higher Education.1975,46(2).
- [2] Gaff J. G.Toward Faculty Renewal:Advances in Faculty,Institutional and Organizational Development[M].San Francisco Jossey Bass 1975:14.
- [3] Bergquist W.H. & S R.Phillips.A Handbook for Faculty Development[C].Washington D.C:The Council of Independent Colleges 1977.
- [4] Zhong Ying. Design of KPI Performance Management Index System Based on BSC theory [J]. Technology and economy, 2016 (12)
- [5] Xie Yanhong. Strategic Performance Appraisal Tool [J]. Business research, 2005 (09)
- [6] Ao Jing. Process Management Method [M]. China Standard Press, 2011

- [7] Miao Xiaohui. Analysis and Research on Performance Evaluation Indicators of Art Creation of Teachers in Art Colleges and Universities - Taking Z Comprehensive Art Colleges and Universities as an Example [J]. Science, Education and Literature Collection, 442 in Total, December 2018 (I)
- [8] Liu Yunguo. Research on Enterprise Performance Evaluation Combining BSC and EVA [J]. Accounting Research, 2007.09
- [9] Du Jun, Du Yong, Yan Bo. Construction of Performance Evaluation Index System for Performance Evaluators Based on BSC and KPI [J]. China Management Informatization, 2010.vol.13, No.9
- [10] Duan yan Wang Jian. Research on the Reform and Evaluation System of University Teachers' Performance [J]. Modern Marketing, 2015, (11)
- [11] Lin Jie, Li Ling. Three Theoretical Models of Teacher Development in American Universities [J]. Modern university education, 2007, (1)
- [12] Zhang Qingrong, Zhang leyong. Research on the Construction of Teaching Development System of University Teachers [J]. Academy Journal Publishing House.
- [13] Li Qing, Huang Yongsheng. Optimization of Performance Evaluation Index System for Teachers in Teaching Oriented Universities - Taking liberal Arts Teachers as an Example [J]. Economist, 2018, (10)
- [14] Mc CLELLAND D C. Testing for Competence Rather than for Intelligence [J]. American Psychologist 1973 (28):1-14.
- [15] Du Xiaoqin, Liu Yunying and Cheng Longdi. An Empirical Study on the Competency Mathematical Model of University Teachers Based on Principal Component Analysis [J]. Textile and clothing education, 2015 (3): 186-189193