A Relationship Model between Teachers’ Scientific Research Output and Teaching Ability based on Big Data Analysis

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Abstract. The relationship between scientific research and teaching is a focal point in the development of higher education. In different environments, the relationship between scientific research and teaching has different characteristics. With the continuous development of society and economy, the teaching and research in universities are facing new demands. The former elite education model is facing unprecedented challenges, and the relationship between teaching and research is being re-examined. At present, the research on the relationship between scientific research and teaching is mainly based on questionnaires. This paper USES big data analysis to design a model of the relationship between teaching and scientific research, and further empirical analysis of the relationship between the two. The aim is to deal with the relationship between teachers' teaching ability and scientific research output correctly, promote the coordinated development of scientific research and teaching, provide a more favorable environment for the benign development of higher education, and further promote the development of colleges and universities in China.

Keywords: Big Data Analysis, Research Output and Teaching Ability, Teaching Capacity, Job Performance, Competence Characteristics

1. Introduction
As the two most important functions of universities, the relationship between teaching and scientific research is an old and enduring topic, which reflects the contradiction between the ideal of universities and the needs of society caused by the development of social economy, politics, science and technology and culture in different historical periods. Throughout the development history of teaching and scientific research, we find that the conflict between university ideal and social needs is often the catalyst for the intensification of the conflict between university teaching and scientific research. "The needs of society are reflected in universities through scientific research, and the conflict between these needs and the ideal of universities is manifested through the contradiction between teaching and scientific research." The intensified contradiction between teaching and research has increasingly towards the separation of teaching and research of producers, the creator of knowledge and knowledge imparter appeared a group of differentiation: in the prestigious university, has the voice control is often the producers of knowledge and creator, and unknown, are at a disadvantage position those restless in the teaching of undergraduate course knowledge. In the new era, the impact of the
popularization, marketization and internationalization of higher education has further unbalanced the relationship between teaching and scientific research in colleges and universities, from the national education policy to the front-line teachers in colleges and universities.

This paper makes use of big data analysis to design a model of the relationship between teachers' scientific research output and teaching ability, and makes further empirical analysis. This research is helpful to enrich the research on the conflict variables and theoretical models of teachers' roles, provide references for subsequent related studies, provide theoretical support for the role positioning of university teachers, and promote the professional development of university teachers. For teachers, this paper focuses on the physical and mental health of young teachers, reflects the humanistic care for teachers, and urges them to find their own career planning needs and research interests.

Based on the previous literature and related theories, this paper makes an empirical analysis of the data obtained from a university's big data platform. Scholars generally use the recursive model of structure or related equation to study the relationship between teachers' scientific research output and teaching ability. In order to further study the unidirectional or bidirectional influence between the two, this paper USES the non-recursive model of structure equation. In addition, communication and cooperation ability and academic innovation ability are the key competencies that affect teachers' scientific research output and teaching ability. Based on the consideration of teachers' key competencies, this paper further analyzes whether the relationship between teachers' scientific research output and teaching ability is independent.

2. Method

2.1 Big Data Technology
At present, most scholars at home and abroad have studied big data from a macro perspective, believing that big data is an information asset with stronger decision-making power, insight, and process optimization ability under the new processing mode [1], and contains high growth rate, diversification and massive characteristics [2]. However, the key point of the "big" of big data is not the "big capacity", but the "big value" hidden behind it. Reviewing previous studies, there are fewer studies on the application of big data analysis in the field of education in China than in foreign countries. Most scholars have analyzed the use of big data analysis in teachers' professional competence and assessment from a theoretical perspective [3]. In addition, some Chinese enterprises have begun to try in this field. Based on the development status at home and abroad, it is not difficult to find that big data is particularly important for education and can be used to analyze and study the relationship between teachers' scientific research output and teaching ability.

2.2 Relationship between Scientific Research and Teaching

2.2.1 The relationship between scientific research and teaching is dialectical and unified. Scholars hold different views on the relationship between scientific research and teaching, including the following three points [4]. First, research and education are negatively correlated. According to this view, the negative correlation theoretical model mainly includes personality difference model, rare model and various incentive system models [5]. Second, research and education are positively correlated. The corresponding theoretical models are G model and traditional wisdom model. Finally, there is no clear link between scientific research and education, and the theory holds that there are three models, including unrelated personality models, bureaucratic fundraising models, and different activity models.

2.2.2 Scientific research promotes teaching. The positive effect of scientific research on teaching mainly includes four aspects [6]. First, scientific research helps to improve the quality of teachers. Through scientific research activities, teaching courses become more enriched and interesting, to improve the teaching ability. Second, scientific research contributes to the cultivation of higher quality
talents. By participating in scientific research activities, teachers can broaden the way of talent training, and create scientific research conditions for their students, improve their practical ability and creative spirit. Third, scientific research helps to promote the construction and development of disciplines. The scientific research carried out by teachers in the school will greatly enhance the scientific research strength and comprehensive strength of the school and lay a solid foundation for the school to further achieve more ambitious goals. Fourth, scientific research appeals to students. Successful scientific research scholars tend to have higher reputation and stronger scientific research ability, which is of great attraction to students and helps schools attract more capital investment and excellent students, so as to further promote the development of high-quality teaching in schools [7-8].

2.2.3 Teaching promotes scientific research. The promoting effect of teaching on scientific research is mainly manifested in two aspects [9]. First, teaching is the basic condition of scientific research. Scientific research activities after numerous experiments to reach conclusions, these conclusions are often written in textbooks, students learn the content, but also scholars for further research theoretical basis and technical route. Second, teaching activities are disseminators of scientific research achievements. Scientific research achievements that have been tested many times are generally included in books and applied to teaching activities, which is not only conducive to the dissemination, continuation and regeneration of scientific research achievements, but also to the realization of their own value to a greater extent, and more conducive to the enrichment and optimization of teaching content [10].

3. Experiment

3.1 Data Sources

The data source of this study is the data provided by teachers themselves, and the reprocessing data obtained through the process of teachers' use of school platform resources, including voice and text information data and information collected and analyzed. Managers conduct comprehensive analysis of these two types of data to provide teachers and schools with visual feedback results, so that they can know about teachers' scientific research and teaching, and then conduct appropriate intervention. The school has a total of 1,987 teachers, including 1,053 male teachers and 934 female teachers. There are 537 teachers with senior professional titles, 1,031 teachers of humanities and social sciences, and 956 teachers of natural sciences. The mean age of the teachers was 38.67 and the standard deviation was 7.02.

3.2 Experimental Design

On the basis of college teachers' job performance and competence characteristics questionnaire, this paper, by using big data analysis, the teachers' information is divided into three parts, including job performance and competence characteristics and background information, and take Likert5 point evaluation way, teachers' job performance can be divided into "extremely good, average and poor", and, in turn, assignment 5, 1, 3, the higher the score indicates that the better the performance; There are five levels of teacher competency, including 0, 1, 2, 3 and 4. Then, confirmatory factor analysis was conducted, and the results showed that the intrinsic quality of the verified model in this paper was better.

SPSS22.0 and AMOS22.0 were used for data analysis. Confirmatory factor analysis was used to check whether there was a common method bias and four models were compared, including single factor, double factor, triple factor and quad factor. The results show that the advantages and disadvantages of the fitting index increase successively.
4. Discuss

4.1 Correlation Analysis between Teaching Effectiveness and Scientific Research Performance

Education effect questionnaire an average of seven questions, used as a measurement of the effectiveness of the education, the use of scientific research performance of the average of the four questions, as scientific research performance indicators used at the same time, the analysis of the overall level of education and scientific research level. The relationship between the correlation coefficient in 31–38, the median is 35, all related coefficient is important. The level of content. The correlation coefficient between overall education level and educational effect is .74, and the correlation coefficient between overall scientific research level and scientific research performance is .80, as shown in Table 1, indicating that the concept of questionnaire survey is highly feasible.

Table 1. Pearson Correlation between Teaching Effectiveness and Research Performance

|                         | Scientific Research Performance | Overall Teaching Level | Overall Scientific Research Level |
|-------------------------|---------------------------------|------------------------|----------------------------------|
| Teaching Effectiveness  | .312***                         | .740***                | .348***                          |
| Scientific Research     |                                 | .346***                | .802***                          |
| Performance             |                                 |                        | .379***                          |
| Overall Teaching Level  |                                 |                        |                                  |

Taking teaching effectiveness and scientific research performance as potential variables and adopting the structural equation model, it is found that the path coefficients from scientific research performance to teaching effectiveness and from teaching effectiveness to scientific research performance are both .35(p < .001), and the two can explain 12% variation mutually, indicating that teaching effectiveness and scientific research performance are correlated rather than independent.

4.2 Analysis of the Influence Direction between Teaching Effectiveness and Scientific Research Performance

The non-recursive model is used to test the influence direction between teaching effect and scientific research performance, and the two potential variables are set as two-way influence relationship. In order to meet the needs of model fitting, refer to Kline's model setting suggestion, academic innovation is set to only predict scientific research performance, and communication and cooperation only predict teaching performance. Except the chi-square test index, the index has good fitting. The chi-square value is greatly influenced by the number of samples and the estimated parameters, which is of little help to the judgment of the model. The standardized path coefficient shows that the standardized path coefficient of scientific research shows that the teaching effectiveness is .24 (p < .001), which indicates that the scientific research performance predicts the teaching effect quite positively, but the standardized path coefficient of teaching effect is -.08(p = .303), which does not reach the significant level, as shown in Figure 1.
Figure 1. Standardized Estimation Path Diagram of the Non-Recursive Model of Scientific Research Performance and Teaching Effectiveness

The above results indicate that the relationship between teaching effectiveness and scientific research performance is unidirectional, that is, the scientific research performance has a significant positive effect on teaching effectiveness rather than the opposite.

5. Conclusion
Through the research, this paper finds that the ability of communication and cooperation plays a greater role in predicting teachers' teaching effectiveness than that of scientific research. The standardized path coefficient of communication is 0.59, which is much higher than the latter. This shows that scientific research performance is not the main factor determining the teaching effect, and the effectiveness of teaching also requires conditions other than scientific research performance, such as the ability to communicate and cooperate. Teaching and scientific research have different requirements on teachers' abilities. Teaching needs good communication skills, scientific research needs a bench; Be interested in scientific research and responsible in teaching. Research and teaching require different abilities. A successful teacher needs to be more open, caring, compassionate and responsible. A successful researcher needs enthusiasm and patience. Communication skills, collaboration and research results accounted for 43 per cent of the variation in teaching effectiveness, while other factors accounted for 54 per cent. The reasons may be achievement motivation, responsibility, and compassion. Academic innovation ability affects teachers' teaching effect indirectly, but not directly. Research performance has a significant impact on teaching effectiveness. The most significant impact on teachers' teaching effectiveness is their ability to communicate and cooperate (measures = 58), followed by research performance (measures = .17), which can explain 44% of the variation in teaching effectiveness.

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