

Teaching Quality Evaluation by Using Big Data in Guangdong University of Finance

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Abstract

The objectives of this research were (1) to study big data-based teaching evaluation indicators for teaching quality evaluation at Guangdong University of Finance and (2) to explore how these indicators can be used to improve the validity and reliability of teaching quality evaluation. This study employed a convergent mixed-methods design. The sample were 286 faculty members selected by simple random sampling and 6 participants selected by purposive sampling for semi-structured interviews. The instruments were a structured questionnaire and a semi-structured interview guide. The data were analyzed by frequency, percentage, mean, standard deviation, and content analysis.

The results revealed that 1) the big data-based teaching evaluation indicators consisted of four dimensions, namely teaching process ($M=3.72$), learning effectiveness ($M=3.80$), course quality ($M=3.89$), and interaction quality ($M=3.87$), all of which were rated at a high level. Within these, "clarity of teaching objectives" ($M=4.01$) and "timeliness of feedback" ($M=4.02$) were perceived as the most important items. 2) The application of big data-based teaching evaluation indicators was perceived by faculty and administrators as capable of improving the validity and reliability of teaching quality evaluation by providing more objective, timely, process-oriented, and evidence-based information to support teaching improvement and educational management.

Keywords: Big data; Teaching quality evaluation; Learning analytics; Higher education

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Introduction

Teaching quality evaluation is widely used in universities to assess teaching effectiveness and support educational reform. However, traditional evaluation systems are often based on student evaluations, peer reviews, and examination results, which may not fully reflect the real teaching situation (Ye & Wu, 2003; Zhang, 2021).

First, traditional evaluation systems tend to show outcome bias. They focus mainly on final results, especially students' examination performance, while paying less attention to the teaching process. Important aspects such as classroom interaction, student participation, and teaching behavior are often not fully captured. Second, traditional evaluation systems are often affected by subjectivity. Student evaluations and peer reviews may be influenced by personal impressions and emotional preferences, weakening the validity and reliability of evaluation results. Third, many existing evaluation systems lack timely feedback. Evaluation results are usually collected at the end of a course or semester, which means that teachers may not receive useful information during the teaching process.

With the development of information technology, especially big data, new opportunities have emerged for improving teaching quality evaluation. Big data technology makes it possible to collect and analyze multi-source teaching data, including classroom behavior, learning processes, teacher-student interaction, and student performance (Wang, 2022). Compared with traditional methods, data-driven evaluation can improve the objectivity, validity, reliability, and timeliness of teaching quality assessment (Siemens & Long, 2011; Ifenthaler & Schumacher, 2021).

Despite these findings, several important gaps remain. Most existing studies focus primarily on theoretical discussions or small-scale applications, with limited empirical evidence from real university settings. Moreover, research focusing on finance-oriented universities in China, particularly Guangdong University of Finance, remains limited. This study takes Guangdong University of Finance as a case to explore how big data can be applied to teaching quality evaluation in a real university context.

This study is significant because it addresses the limitations of traditional teaching quality evaluation and explores how big data can improve the validity, reliability, objectivity, and usefulness of evaluation results in higher education. From a theoretical perspective, this study introduces big data technology into teaching quality evaluation and supports a shift from an outcome-based evaluation model to a process-oriented evaluation model. From a practical perspective, this study can help identify problems in teaching more accurately, support teachers in improving teaching strategies, and enhance classroom effectiveness.

Literature Review

Concepts and Related Theories

The framework of this study is grounded in Constructive Alignment Theory (Biggs & Tang, 2011), which posits that effective teaching depends on the alignment among learning objectives, teaching activities, and assessment methods. This theory supports the dimensions of Course Quality and Learning Effectiveness.

Furthermore, Learning Analytics Theory (Siemens & Long, 2011) provides the technological and methodological basis for this study. It focuses on the collection, analysis, and use of educational data to understand and improve teaching and learning processes, thereby supporting the Teaching Process and Interaction Quality dimensions.

Based on a synthesis of the literature, this study adopts a framework comprising four key dimensions of teaching quality evaluation:

1. Teaching Process: Refers to the implementation of teaching activities, measured by classroom interaction frequency, teaching method diversity, and homework appropriateness.
2. Learning Effectiveness: Refers to the outcomes achieved by students, measured by test pass rate, score improvement, and learning goal achievement.
3. Course Quality: Refers to the overall standard of course design, measured by scientific rigor of course content, clarity of teaching objectives, and rationality of assessment methods.

4. Interaction Quality: Refers to the effectiveness of communication between teachers and students, measured by depth of teacher-student interaction, student participation level, and timeliness of feedback.

Conceptual Framework

Figure 1 illustrates the conceptual framework of this study, demonstrating how the four dimensions of big data-based indicators provide the foundation for evaluating teaching quality, with the aim of improving its validity and reliability.

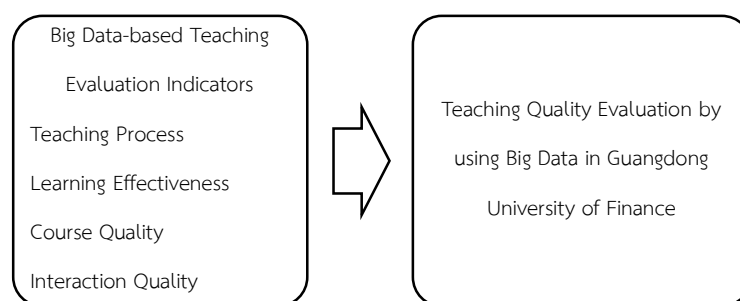


Figure 1: Conceptual Framework of the Study

Research Objectives

1. To study big data-based teaching evaluation indicators for teaching quality evaluation at Guangdong University of Finance.
2. To explore how big data-based teaching evaluation indicators can be used to improve the validity and reliability of teaching quality evaluation at Guangdong University of Finance

Scope and Significance of the Study

This study focuses on faculty members' perceptions of big data-based teaching quality evaluation indicators in higher education, with specific reference to Guangdong University of Finance. The proposed framework comprises four dimensions: Teaching Process, Learning Effectiveness, Course Quality, and Interaction Quality. The study uses questionnaire data collected from 286 faculty members and

qualitative data obtained through semi-structured interviews with 6 administrators, teachers, and IT staff.

The study is significant for several reasons. For university administrators, it can help obtain more valid and reliable evidence about teaching quality. For teachers, it can provide clearer and more timely feedback. For students, it may lead to improved learning experiences. For future researchers, it provides an empirical framework for further investigation. However, this study does not directly collect or analyze operational data from institutional databases. The findings are specific to the institutional setting of Guangdong University of Finance and should not be generalized directly to other contexts.

Research Methods

Population and Sample

This study takes Guangdong University of Finance as a case study. The population consisted of all 1,000 faculty members at the university. The sample size was determined using Yamane's (1973) formula with a 95% confidence level and a 0.05 margin of error, resulting in 286 participants. Simple random sampling was employed to ensure representativeness. In addition, six participants were selected by purposive sampling for semi-structured interviews. This small number was chosen to gather in-depth, context-rich information from key informants (two academic administrators, two experienced teachers, and two IT/data management staff), whose strategic positions provide critical insights into the institutional evaluation system.

Research Instruments

The primary data collection tools were a self-designed questionnaire and a semi-structured interview guide. The questionnaire consisted of 36 items organized into four dimensions: teaching process, learning effectiveness, course quality, and interaction quality. Each item was rated on a 5-point Likert scale. Three experts evaluated the questionnaire's validity using the Index of Item-Objective Congruence (IOC), with an average score of 0.96. The questionnaire's reliability was assessed using Cronbach's alpha coefficient, which was 0.91, indicating high internal consistency.

Data Collection and Analysis

Questionnaires were distributed online. Semi-structured interviews were conducted either face-to-face or online. SPSS software was used to perform descriptive statistical analysis (frequency, percentage, mean, standard deviation). Content analysis was applied to the qualitative data from the interviews. In line with the convergent mixed-methods design, the qualitative findings were used to explain, elaborate on, and triangulate the quantitative results, providing a more complete understanding of the research problem.

Research Results

The results revealed that 1. The big data-based teaching evaluation indicators were examined from four dimensions. According to the results of the faculty survey (Table 1), all four dimensions were rated at a high level. Course quality received the highest mean score ($M = 3.89$, $SD = 0.67$), followed by interaction quality ($M = 3.87$, $SD = 0.69$), learning effectiveness ($M = 3.80$, $SD = 0.70$), and teaching process ($M = 3.72$, $SD = 0.74$).

Table 1 Descriptive Statistics of Big Data-Based Teaching Evaluation Indicators (N = 286)

Dimension	Mean	S.D.	Interpretation	Rank
Course Quality	3.89	0.67	High	1
Interaction Quality	3.87	0.69	High	2
Learning Effectiveness	3.80	0.70	High	3
Teaching Process	3.72	0.74	High	4
Overall	3.82	0.70	High	-

Table 2 Item-Level Descriptive Statistics (N = 286)

Dimension / Item	Mean	S.D.
Course Quality		
Clarity of teaching objectives	4.01	0.61
Scientific rigor of course content	3.94	0.64
Rationality of assessment methods	3.92	0.66
Interaction Quality		
Timeliness of feedback	4.02	0.61
Depth of teacher-student interaction	3.93	0.65
Student participation level	3.89	0.67
Learning Effectiveness		
Learning goal achievement	3.91	0.65
Score improvement	3.86	0.67
Test pass rate	3.74	0.71
Teaching Process		
Teaching method diversity	3.88	0.68
Classroom interaction frequency	3.76	0.72
Homework appropriateness	3.71	0.76

The qualitative findings from the interviews confirmed and expanded upon the quantitative results.

Teaching Process: Participants agreed that big data can provide objective evidence for classroom interaction and teaching methods. P1 stated, “Traditional evaluation mainly relies on classroom observations. Big data can collect information on participation and discussions, providing more objective evidence.”

Learning Effectiveness: Participants emphasized the importance of tracking progress. P3 noted, “Score improvement is more meaningful than a single final exam. It shows the student's development throughout the course.”

Course Quality: Participants highlighted the importance of alignment. P6 explained, “Course quality evaluation should focus on the relationship among learning objectives, teaching activities, and assessments.”

Interaction Quality: The timeliness of feedback was a key concern. P2 stated, “Students benefit most when teachers provide feedback promptly, as it allows them to correct mistakes immediately.”

Research Discussion

The results of this study are discussed according to each research objective.

1. Regarding the first objective, this study found that big data-based teaching evaluation indicators at Guangdong University of Finance consist of four main dimensions. All dimensions were rated at a high level. Course quality received the highest level of recognition, which supports Biggs and Tang's (2011) constructive alignment theory. Interaction quality was also highly recognized, matching Chickering and Gamson's (1987) principles. Learning effectiveness aligns with Hattie's (2009) view on the importance of student outcomes. The relatively lower rating for Teaching Process might suggest that faculty are more certain about evaluating static elements like course design than dynamic classroom behaviors through big data. This finding is consistent with Zhang, H. (2021) and Ye and Wu (2003), who emphasized that teaching quality evaluation should incorporate multiple dimensions to reflect the complexity of teaching and learning processes. The finance-oriented context of Guangdong University of Finance may explain the relatively high rating for Course Quality, as finance education emphasizes structured curriculum design, clear learning outcomes, and rigorous assessment standards. This institutional characteristic aligns well with the priority faculty members placed on well-designed courses and teaching objectives.

2. Regarding the second objective, the study found that big data-based teaching evaluation indicators were perceived by participants as capable of effectively improving the validity and reliability of teaching quality evaluation. Big data was seen as improving validity by enabling evaluation to capture multiple dimensions of teaching activities more accurately. Reliability was perceived as improved by reducing subjectivity. This finding is consistent with Zawacki-Richter et al. (2019) and Siemens and Long (2011), who argued that digital technologies and learning analytics provide more accurate and reliable evidence for educational evaluation.

Limitations of the Study

This study has several limitations. First, the findings are based on a single institution (Guangdong University of Finance), limiting generalizability. Second, the cross-sectional design captures perceptions at a single point in time. Third, and most importantly, the claim that big data improves validity and reliability is based on participant perceptions and qualitative arguments, not on an empirical comparison (e.g., pre- vs. post-implementation). Future research should employ experimental or quasi-experimental designs to empirically test these claims.

New Knowledge

New Knowledge

This study contributes to the field by empirically testing an integrated, four-dimensional framework for big data-based teaching quality evaluation within the specific context of a finance-oriented university in China. Unlike previous studies that often focused on single indicators or theoretical models, this research provides practical evidence on how faculty and administrators perceive the relevance and applicability of these indicators. The key novel insight is the confirmation that while such a framework is perceived as valuable, its successful implementation hinges on addressing practical concerns related to data integration and teacher data literacy.

Research Suggestions

1. Practical Implementation Suggestions

Construct a comprehensive system: Integrate the four key dimensions into the university's evaluation framework and establish a unified data platform.

Strengthen data quality and teacher training: Establish clear data standards and provide training programs to improve teachers' data literacy.

Establish continuous feedback mechanisms: Provide regular, data-driven feedback reports to teachers, combining quantitative data with professional judgment.

2. Suggestions for Future Research

Expand research scope: Include respondents from other universities to improve generalizability.

Adopt longitudinal designs: Examine the long-term impact of big-data evaluation on teaching improvement.

Conduct comparative studies: Compare big-data evaluation practices across different disciplines and institutional types.

Empirical validation: Future research should directly compare big-data based evaluation against traditional methods to empirically measure its impact on validity and reliability.

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