

Evaluation System Framework for the Effectiveness of E-commerce Applied Teacher Training under the Background of New Liberal Arts Construction

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Abstract

E-commerce is a typical new liberal arts major in many applied undergraduate colleges in China. This major requires not only learning business management knowledge, but also mastering information technology and data analysis knowledge, so it places higher demands on the professional ability of teachers. At present, there are many types of teacher training for college teachers, and the quality is uneven. How to better improve the data analysis teaching and practical ability of e-commerce teachers is an urgent problem that teachers and professional construction personnel need to solve. Drawing on the capability maturity model, a framework for measuring the effect of e-commerce data analysis ability teacher training is proposed for reference. The framework believes that the effect of e-commerce teacher training can be measured from two perspectives and five levels: theoretical teaching ability and practical ability.

Keywords

Ability maturity; E-commerce teachers; Teacher training; training effect; New liberal arts construction.

1. Introduction

On April 19, 2021, General Secretary of Chinese Government Xi Jinping pointed out during his inspection of Tsinghua University that higher education should make good use of the "catalyst" of interdisciplinary integration to promote the construction of new engineering, new medicine, new agriculture, and new liberal arts, and accelerate the training of scarce talents. " This is General Secretary Xi's important instruction on the construction of the "four new" disciplines, which points the way for the development of higher education. In 2021, the Teaching Steering Committee of E-commerce Majors of Higher Education Institutions of the Ministry of Education held a seminar on the "Construction of New Liberal Arts and E-commerce Majors". The positioning and development direction of the e-commerce major were further clarified. Therefore, as a newly established application-oriented undergraduate college, it is imperative for the e-commerce major, which is responsible for the cultivation of applied talents, to carry out planned training of teachers based on the construction of new liberal arts.

Although the higher education community has conducted fruitful explorations on interdisciplinary integration in the past, these explorations have mostly focused on the curriculum system and practice of education and teaching (Su Jianjun, Wu Hairong, 2023; Tan Lingling, Niu Xiuhong, 2023), teaching methods and means (Mengrui Zhu, Jiankun Wang, 2023; Wu Jianghui, 2019), and talent training innovation (Ying Luo, Zhi-quan An, 2022; Li Caifeng, 2022). Some scholars have noticed that teacher training and teacher development (Zhang Wenpei, 2017; Meng Qin et al., 2020), which mainly focuses on the needs of teacher training (Song Qiong, Zhu Xudong, 2017), the perception and impact of teacher training (MB.Ulla, 2017), the analysis of the benefits of further education (KL Biraimah, AL Jotia, 2013), and the methods

and means of further education (A Naylor, J Gibbs, 2018). However, the exploration of interdisciplinary integration teacher training for e-commerce majors is relatively scarce. Among the three feasible aspects of cross-integration of e-commerce, the first is integration with data science (Yang Fangming, Liu Mancheng, 2021). Therefore, it is theoretically necessary to explore data analysis training for e-commerce teachers.

Based on the above research background, how to improve the effect of applied teacher training in e-commerce data analysis to meet the needs of new liberal arts construction is a direction worth exploring. There are many types of training for teachers on the market, but which training can achieve the purpose of further study for colleges and universities or teachers is a practical problem that needs to be solved.

of this study is to make a moderate expansion of the theory of teacher continuing education. It attempts to explore the complementary data analysis training system and advancement path for e-commerce teachers from the dual perspectives of school and enterprise, which can provide theoretical support for the planned further training of the discipline and also provide reference for the integration and interdisciplinary construction of other disciplines.

From a practical perspective, its significance lies in analyzing the training and further study needs and capacity deficiencies of e-commerce teachers in applied universities in data-related courses from a specific perspective. It will accelerate the integration of disciplines and guide the development of in-service teacher training in the future to a certain extent, which will help to systematically improve the training effect of teachers.

2. Literature Review

Academics have long focused on the important role of teacher training programs in improving teacher performance and student outcomes. A review of current research on teacher professional development by Cook, Baker, and Oluwole (2020) found that well-designed programs can improve teacher effectiveness and student outcomes. In addition, a study by Koedel and Parsons (2020) investigated the long-term impact of a teacher professional development program in Missouri and found positive effects on teacher performance. Another study by Kalogrides, Koedel, and Parsons (2021) also found that teacher professional development programs have a positive causal effect on student achievement. These findings highlight the need for teachers to have ongoing training support and professional development opportunities to strengthen their teaching practices and benefit student learning.

Darling-Hammond (1997) found that teacher education programs in different countries have their own characteristics in terms of best practices and effective methods. China is also actively exploring teacher training that is suitable for the times and national conditions. A study by the National Center for Education Evaluation and Regional Assistance (NCEE) in the United States found that teachers who participated in high-quality, work-based professional training programs improved their teaching and student performance compared to teachers who did not participate in training (Dee & Dee, 2013). Hattie (2009) further meta-analyzed teacher training programs and found that when teachers participated in professional practice activities, their students' performance scores increased by an average of 9 percentage points. In addition, Desimone (2009) emphasized the importance of appropriate conceptualization and measurement in teacher training program research.

The Capability Maturity Model (CMM) was originally a framework for evaluating and improving software organizational processes. The latest research on CMM focuses on how it adapts to the changing needs of software development and the increasing popularity of agile methods. CMM has also been widely used in other fields, such as evaluating training and learning in education. Wei Fei (2016) used the capability maturity model to study teacher training institutions for hybrid training. In 2018, Jia Jianfeng constructed a university innovation and entrepreneurship

course based on the capability maturity model. Liao Hongjian and Qu Zhe (2022) divided the hybrid teaching capability maturity of colleges and universities into five levels: "initial level, cognitive level, development level, mature level and optimization level"; and then determined the nine key process areas under the five levels through interviews and Delphi method, and 19 evaluation indicators under the key process areas. The hybrid teaching of a university in the Guangdong-Hong Kong-Macao Greater Bay Area was evaluated and applied. It can be seen that the application of the capability maturity model in the field of education to analyze teaching and curriculum reform has become relatively mature, and with the deepening of research, scholars have continuously improved the capability maturity model according to specific application scenarios. However, there are two issues worth noting: first, there is a lack of relevant research on e-commerce majors; second, theoretical teaching ability and practical business ability are not evaluated separately.

3. Construction of An Evaluation System Based on The Capability Maturity Model

The Capability Maturity Model was originally developed as a tool to objectively assess the ability of government contractors to implement contract software projects. The Capability Maturity Model includes five levels: initial level, repeatable level, defined level, managed level, and optimized level (Wei Fei, 2016). The initial five levels are explained as follows: At the initial level, the completion of the business process is unstructured. There is almost no formalization, and the relevant capabilities are mastered by individuals and complete the business. Repeatable level, basic processes have been established and always followed. There is some standardization, but it is usually limited to specific business activities. The focus is mainly on achieving repeatable results. At the defined level, the relevant business and processes are clearly defined and standardized throughout the organization. The focus is on using indicators for continuous improvement. At the managed level, the organization uses quantitative data and statistical methods to continuously monitor and control its processes. The focus is on continuous improvement through measurement and analysis. At the optimized level, the organization continuously improves its processes based on data and experience. It has a culture of continuous improvement processes and a focus on innovation. Subsequent scholars have basically followed the initial five-level classification. But the expression is slightly different. This study follows the classic five-level framework and makes minor adjustments to the expression for the education industry. The five levels are defined as the initial level, basic level, applicable level, skilled level, and expert level. Since this study is aimed at applied undergraduate colleges, teachers are required not only to master relevant theories but also to understand practical production as much as possible. Therefore, two aspects are derived from each level: theoretical teaching ability and practical business ability. The specific evaluation system structure is shown in Table 1:

The five levels in the framework are progressive at the academic level, but in practice, only one or two levels of training can be focused on. For example, a teacher training course mainly focuses on analytical methods, but does not involve a business indicator system. From the perspective of the trainees, there is only a training effect at the application level, and there is basically no effect at other levels. A training course that takes all five levels into consideration is a comprehensive training. Evaluating a teacher training course from the five levels is a comprehensive evaluation of the teacher training course.

Table 1. Construction of data analyst training evaluation system based on capability maturity model

Teachers' ability level (first-level indicator)	Teacher training can improve the data analysis theory teaching ability (secondary indicator)	Teacher training can improve the practical ability of data analysis (secondary indicator)
Initial level	Rethinking and teaching the application and prospects of data analysis	The current process and key points of data analysis practice
Basic level	Deepen your mastery of advanced mathematics and operations research fundamentals through on-the-job training.	Mathematics and operations research knowledge points that can be applied in current practical work
Applicable levels	Mastering and teaching efficient analytical methods and tools	Master the current commonly used practical analysis methods and analysis tools
Proficiency level	Ability to teach the theory of data operation business theory and business indicator system	Data operation business capabilities and business understanding of data indicators in practice.
Expert level	Be familiar with and able to teach academic progress and research hotspots in data analysis.	Solve difficult problems in data analysis practice and have the ability to diagnose business problems.

In terms of theoretical teaching ability: The theoretical ability of the initial teacher training should emphasize the understanding of the application overview and prospects of data analysis. Although college teachers generally have a relatively deep theoretical accumulation in e-commerce data analysis. However, there is a certain difference in the perspective of teachers on the application trend and prospects of data analysis in the business world and the understanding of enterprise personnel. The integration of this difference is an important part of improving teaching ability. Therefore, the teacher training process should try to supplement the trend and prospect cognition from the perspective of the enterprise. For example, SAS statistical analysis tools may be optimistic about the future of the academic community from a professional perspective. However, people in the business community may prefer easy-to-use analysis tools. This may eventually lead to other analysis tools winning by relying on user groups, which will lead to the gradual shrinking of more professional tools. Different perspectives have different understandings of the prospects of data analysis. This is one of the purposes of college teachers participating in teacher training. At the basic level, if the in-service training allows teachers to have a further understanding of the theory of advanced mathematics and operations research and improve their teaching skills, it can be regarded as achieving the training effect at this level. At the application level, the understanding of analysis tools and analysis methods by teachers participating in the training is actually an understanding of methodology. Teachers should not only be able to apply methods (practical ability), but also understand and teach the mechanism of action of methods (theoretical ability). At the proficiency level, on the one hand, teachers' understanding of operational business theory and indicator system architecture is based on theoretical learning. On the other hand, without the understanding of business theory and indicator system architecture, it is impossible to carry out actual work flexibly, and there is no way to talk about practical ability at the proficiency level. Not understanding the purpose of business theory and data indicators and rigidly applying data structures are not proficient data analysis capabilities. Therefore, these two

requirements should belong to the theoretical ability requirements at the proficiency level. Finally, the grasp and teaching of the academic frontier of data analysis should belong to the theoretical teaching ability at the expert level.

In terms of practical ability: understanding the process and key points of data operation is the beginning of data analysis practice, so this should be the initial requirement at the initial level. If students want to master data analysis work, they should also know the corresponding theoretical basis behind the practical steps, so this is the basic level requirement of teacher training. At the applicable level, trainees are required not only to understand the data analysis methodology but also to demonstrate the specific application of enterprises. There may be several ways to solve the same problem, but the business community may consider a certain analysis method from a specific perspective, which actually reflects the selectivity of practical work. This is a problem that should be considered at the application level, so it is defined as practical ability at the application level. However, a solid mathematical foundation and mastering the analysis methods and tools commonly used in the business community cannot make e-commerce teachers familiar with corporate practice. Another important foundation for corporate practice is to understand the true meaning of business data. The number of page views of e-commerce consumers' product pages must be analyzed together with the product category. It is meaningless to analyze the number of consumer views without category. Because impulse purchases are normal for some categories of products, multiple views are not required. This has nothing to do with mathematical foundations, nor with the mastery of analysis methods. This requires an in-depth understanding of specific business indicators. Therefore, combining specific business indicators and systems to make accurate analysis is a requirement that should be achieved at the proficient level. In practice, the hierarchical order between mathematics, tools and methods, and business is also obvious. If business indicators are regarded as the basic layer, it is difficult to cultivate mathematical ability based on business indicators. However, more practice of business processes based on mathematical ability can help to understand business indicators well.

According to the above table and related explanations, the e-commerce data analysis teacher competence is summarized into two competences and five levels. The part that may cause controversy is whether there is any conceptual similarity or overlap between the application and proficiency levels and practical competence. From a theoretical point of view, on the one hand, the capability maturity model is widely used by the academic community to explain various competences (Wei Fei, 2016). On the other hand, practical competence as a type of competence is also generally recognized by the academic community. Therefore, practical competence should be included in the capability maturity framework. From a practical point of view, being able to complete business and being proficient in completing business precisely reflect the difference between practical competence at different levels. The overall horizontal and vertical framework of five levels and two competences has certain rationality. However, the meaning of specific cells in the framework needs further discussion.

4. Conclusion and Discussion

Starting from the construction of e-commerce teachers, this study clarifies the problems and significance of teacher training for college teachers under the background of the new liberal arts. A preliminary review of the relevant research on the capability maturity model was conducted. With the construction of the new liberal arts as the background, a framework for e-commerce professional data analysis training based on the capability maturity model was proposed. A step-by-step hierarchical training path was proposed. It emphasizes that the teacher training of e-commerce majors should start from the initial level, focus on the cultivation of mathematical foundations and application methods, and then build an expert

teaching team with both theoretical teaching and practical capabilities. This framework has a certain preliminary reference value for teacher training in other majors. Due to the lack of previous literature research, there is still room for improvement and perfection in the framework structure. In the future, discussions can be conducted based on the actual conditions of different majors, courses and teacher teams to further refine the specific content under the overall framework. How to apply this framework to measure the training effect in training practice should also be further discussed.

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