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Optimizing Course Combination and Teaching Content for the Big Data Intelligent Marketing Course Cluster

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Abstract. This study addresses the issues of unclear course focus, redundant content, poor alignment with foundational courses, and lack of integration with generative artificial intelligence in the "Big Data Intelligent Marketing" course cluster. A systematic optimization plan is proposed. By expanding the course combination to strengthen the foundation of data management and the application of generative AI technologies, and by restructuring the teaching content to clarify the positioning and logical relationships of each course, the optimized course cluster forms a progressive system of "foundation-application-frontier." This provides theoretical and practical references for the construction of marketing major course clusters.

Keywords: Marketing major; course cluster; course combination; teaching content

1. Introduction

Chongqing University of Posts and Telecommunications' Marketing Major focuses on cultivating marketing professionals with distinct characteristics in "big data + intelligence + new media." To effectively support the professional training objectives and highlight the professional features, a "Big Data Intelligent Marketing" course cluster was established in the training program. Initially, the course cluster consisted of five courses: Introduction to Business Data Science, Statistics (theory course and independent practice course), Marketing Engineering Application Experiment, Big Data Marketing, and Intelligent Marketing. The goal is through this course cluster, students would understand the industrial background of big data intelligence, become familiar with the methods, technologies, and tools of big data and intelligent marketing, and possess the ability to comprehensively apply marketing theories, data, models, and software for marketing analysis, planning, and management. During the operation and construction of the course cluster, some problems gradually emerged. To better achieve the teaching objectives of the course cluster, it is necessary to optimize the course combination and teaching content.

Existing literature on the construction of course clusters in economic and management majors has considered the background of big data [1,2] and the demand for industrial chain alignment [3], emphasizing the concept of Outcome-Based Education (OBE) [4,5]. There are studies focusing on the course clusters of a specific major in economic and management

[6,7,8], as well as explorations of general education course clusters in these fields [9]. While the existing literature provides references for the construction of course clusters in economic and management majors, there are also shortcomings. Most literature focuses on discussing construction objectives, concepts, and ideas, with few provide detailed analysis of course structure and content. Research specifically targeting the "Big Data Intelligent Marketing" course cluster in the marketing major is still rare. This study focuses on the course combination and teaching content of the course cluster to optimize the "Big Data Intelligent Marketing" course cluster.

2. Problems to be solved and optimization ideas

2.1. Problems in course teaching content

The pre-optimization course cluster included five courses. "Statistics" is a classic disciplinary foundation course, and "Marketing Engineering Application Experiment" is offered in some universities. The other three courses in data science and intelligence were recently introduced with limited references and lacked course construction experience to draw upon. The teaching content of each course before optimization is as follows:

Introduction to Business Data Science. The teaching content covered the basic knowledge of data science; an introduction to the main tools for commercial data processing, including Octopus Collector, Tableau, Python, and R. The experimental content included the installation and basic operation or syntax of the aforementioned software.

Statistics (Theory Course and Independent Practice Course). The teaching content included descriptive statistics, statistical charts, sampling distributions, parameter estimation, hypothesis testing, correlation and regression, time series, and statistical indices. The practical content involved the operation of SPSS software.

Marketing Engineering Application Experiment. The teaching content covered the basic principles of market response models and more than ten quantitative models for marketing strategy and tactical decision-making. The experimental content included the operation of marketing engineering software.

Big Data Marketing. The teaching content included data collection using Octopus Collector, data cleaning in Excel, data visualization with Tableau, basic syntax of Python and R, Python web crawling, R statistical analysis, and implementation of marketing prediction models using Python and R. The experimental content included the basic use of the aforementioned software and programming languages.

Intelligent Marketing. The teaching content included basic knowledge of machine learning, principles of common machine learning algorithms, an introduction to mainstream deep learning frameworks, and intelligent marketing application cases based on deep learning. The experimental content included the setup and training of typical algorithm models.

Overall, there were two main issues with the above course teaching content. First, the content of some courses was extensive and lacked clear positioning. Second, there was repetition of teaching content between courses, and the logical relationships between courses were not clear.

2.2. Problems with integration with foundational courses

The course cluster is based on mathematics and computer courses. However, the traditional mathematics and computer foundational course clusters do not provide the necessary

knowledge for this course cluster very well. On the one hand, mathematics and computer foundational courses are designed to provide a general foundation for all majors and have not been specifically optimized for big data intelligent courses. On the other hand, the big data intelligent courses in the marketing major focus on the application of data analysis tools and artificial intelligence tools, while traditional mathematics and computer foundational courses focus on algorithm design and programming, which are different emphases. The above reasons lead to certain integration issues between this course cluster and the mathematics and computer foundational courses.

2.3. Problems with integration of generative artificial intelligence

The teaching content of the course cluster does not fully reflect the new progress in artificial intelligence technology. The latest technologies such as large language models only appear sporadically as additional modules and have not been deeply integrated into the course system. The course cluster lacks sufficient expansion in the application of generative artificial intelligence in marketing and has certain integration issues with generative artificial intelligence.

2.4. Course cluster optimization ideas

Considering the above problems to be solved, taking the opportunity of the revision of the training program, optimization ideas are proposed for the course cluster: expanding course combinations and enhancing teaching content. The optimization ideas for the course cluster are shown in Figure 1.

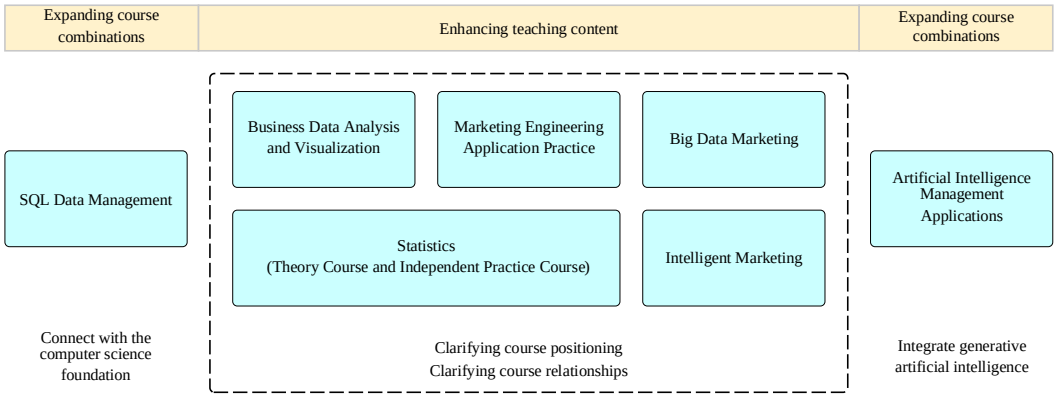

Figure 1. Course Cluster Optimization Ideas

3. Expansion of course combinations

The expansion of course combinations includes two aspects: First, the introduction of a new course, "SQL Data Management," to better connect with the computer science foundation; and second, the introduction of "Artificial Intelligence Management Applications" to better integrate generative artificial intelligence.

SQL Data Management. The main task of this course is to use SQL language to perform database-related operations and manage and maintain corporate databases. The specific content includes methods for using, designing, managing, and maintaining databases. Through this course, students can acquire knowledge of database usage, possess

the ability to design, manage, and maintain databases, and lay a solid foundation for advanced coursework and future data analysis roles.

Artificial Intelligence Management Applications. The main task of this course is to use generative artificial intelligence to solve problems in specific management application scenarios through problem analysis, prompt design, and intelligent agent workflow design. The specific content includes lectures, demonstrations, and hands-on operations of application cases of generative artificial intelligence in the management field, covering various management application scenarios such as market research and marketing plan design, financial statement analysis, and resume screening. Through this course, students can acquire the basic knowledge of generative artificial intelligence and develop the ability to use generative artificial intelligence to solve management problems.

4. Enhancement of teaching content

The enhancement of teaching content includes two aspects: First, clarifying course positioning and further refining the extensive teaching content; and second, clarifying course relationships and reallocating the existing teaching content among the courses.

Business Data Analysis and Visualization. The main task of this course is to use spreadsheet software, business intelligence software, generative artificial intelligence, and other tools to analyze and mine the characteristics and patterns of commercial data, present them visually, and solve data-driven decision-making problems in enterprise management application scenarios. The specific content includes data querying, data cleaning, data modeling, data visualization, and the automation and intelligent implementation of some of the above functions, forming management suggestions based on data analysis results. Through this course, students can acquire the basic knowledge of business data analysis and develop the ability to use data analysis and visualization tools to solve practical management problems.

Statistics (Theory Course and Independent Practice Course). The main task of this course is to systematically master the basic concepts, principles, and methods of statistics. The specific content includes data collection and organization, descriptive statistics, inferential statistics, correlation and regression analysis, time series analysis, and index analysis, combined with theoretical method lectures, case analysis, and software operation. Through this course, students can understand statistical thinking, become familiar with statistical methods, master the operation of statistical software, and develop the ability to use statistical tools to handle complex socio-economic problems.

Marketing Engineering Application Practice. The main task of this course is to use marketing engineering models and software to provide quantitative solutions to complex problems in the field of marketing management. The specific content includes basic knowledge of market statistical testing, predictive simulation, and factor regression modeling; marketing engineering models such as advertising budgeting, choice behavior market segmentation, competitive bidding pricing, value-based pricing, learning curve pricing, competitive advertising, universal benefits, and retail promotion; and methods such as AHP (Analytic Hierarchy Process) and SEM (Structural Equation Modeling). Through this course, students can acquire the basic concepts of marketing engineering, understand the modeling methodology and basic principles, become familiar with the main marketing engineering models, master the skills of using marketing engineering software, perform calculations and analyses based on specific case data, and develop the ability to use marketing engineering methods to solve practical marketing problems.

Optimizing Course Combination and Teaching Content for the Big Data Intelligent Marketing Course Cluster

Big Data Marketing. The main task of this course is to use Python tools to achieve marketing data processing, visualization, and machine learning. The specific content includes the installation and use of Python tools; applications of Numpy, Pandas, Matplotlib, Seaborn, pyecharts, and Scikit-Learn; and practical model applications. Through this course, students can acquire the basic concepts of big data marketing, understand the methodology and principles of big data marketing, become familiar with the main big data marketing models, master Python skills, find valuable analytical results for managerial judgment and decision-making through fast and effective data analysis, and basically develop the ability to use big data marketing technologies to solve practical marketing problems and discover the huge business opportunities hidden in the data.

Intelligent Marketing. The main task of this course is to use Python tools to achieve the automation, real-time, and personalization of marketing management. The specific content includes linear regression and logistic regression models, decision tree models, Naive Bayes models, K-Nearest Neighbors algorithm, Random Forest models, AdaBoost and GBDT models, XGBoost and LightGBM algorithms, feature data preprocessing and data dimensionality reduction PCA models, data clustering and segmentation analysis algorithms, intelligent recommendation systems and association analysis, and deep learning neural network models. Through this course, students can deepen their understanding of the general architecture of business intelligence and commonly used marketing decision models, and cultivate the ability to apply recommendation algorithms, customer behavior analysis models, marketing engineering models, and other technologies for automatic demand recognition, product personalized recommendation, and user intelligent management.

The optimized teaching content is more focused, the relationships between courses are clearer, and redundant content between courses is reduced. This is reflected in three groups of course relationships. First, "Business Data Analysis and Visualization" focuses on the application of "what you see is what you get" software for simple marketing data analysis and visualization in daily office scenarios, while "Big Data Marketing" focuses on complex marketing data analysis modeling and visualization in massive data scenarios using Python language. Both courses have achieved clear content and level distinctions. Each course is also more focused, avoiding the problem of extensive content. Second, both being Python application courses, "Big Data Marketing" mainly teaches data cleaning, analysis, and visualization of marketing big data and introduces the basics of machine learning, while "Intelligent Marketing" systematically teaches the application of various machine learning models and algorithms in the field of marketing management. The content of the two courses does not overlap, achieving better connection and a progressive difficulty relationship. Third, both being courses on marketing model applications, "Marketing Engineering Application Practice" focuses on using "what you see is what you get" software to make quantitative decisions on marketing strategy issues, while "Intelligent Marketing" focuses on using Python tools and machine learning models to make automated and intelligent decisions on automatic recognition and personalized recommendation issues based on massive data. The two courses have clear distinctions in content and difficulty.

5. Conclusion

This study addresses the issues of unclear course focus, redundant content, poor alignment with foundational courses, and lack of integration with generative artificial intelligence in the "Big Data Intelligent Marketing" course cluster of Chongqing University of Posts and Telecommunications' Marketing Major. An optimization plan of expanding course combinations and enhancing teaching content is proposed. By introducing new courses "SQL Data Management" and "Artificial Intelligence Management Applications," the connection with the computer science foundation and the integration of generative artificial intelligence are strengthened. By restructuring the teaching content, the positioning and logical relationships of each course are clarified, repetition is reduced, and a progressive system of "foundation-application-frontier" is formed. The optimized course cluster better fits the professional characteristics, further solidifies the disciplinary foundation, and enhances technical foresight. This study provides theoretical and practical references for the construction of marketing major course clusters but still needs to further verify the teaching effect and establish a dynamic update mechanism to adapt to technological iteration. In the future, the course system can be continuously optimized in combination with interdisciplinary cooperation and industry demands to cultivate more competitive compound talents.

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