

Application of Visual Big Data in Education Management

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Abstract: This article explores the application of visual big data in educational management. First, the concept of visual big data and its main functions are introduced, including graphic trend display, multi-dimensional hierarchical correlation analysis and dynamic academic portrait presentation. Subsequently, the article focuses on strategies for applying visual big data to educational management, such as teaching situation analysis, academic monitoring and early warning, and decision support services.

Keywords: Visualized big data; Education management; Charting trends

1. Conceptual connotation of visual big data

Visualizing big data refers to the process of presenting and analyzing large data sets by visual means. This method greatly improves the efficiency and effect of information transmission by converting complex data information into intuitive and easy-to-understand graphics and charts. In the concept of big data, its core features are huge amount of data, diverse types and fast update speed ^[1]. The application of visualization technology is to solve the problem of understanding and processing big data because of its huge and complex. Through visualization, complex data relationships and patterns can be quickly identified and understood, thus supporting more efficient and accurate decision-making.

Visualized big data not only includes basic charts and graphic displays, such as bar charts, line charts, pie charts, etc., but also includes more complex visualization forms, such as heat maps, geographic information system (GIS) mapping, dynamic charts, etc. These advanced visualization technologies can display the deep relationships and dynamic changes between data, providing users with richer and more detailed insights. In the field of education management, the application of visual big data is particularly important. It can help education managers quickly understand a large amount of teaching data, such as student performance, participation, course effects, etc., so as to make decisions in teaching strategies, course design, resource allocation, etc. Make more scientific and reasonable decisions. In general, visual big data provides an intuitive and efficient method for processing and understanding complex data sets. For educational managers, this method not only improves the efficiency of data processing, but also enhances the accuracy of decision-making, and timeliness.

2. Main functions of visual big data display

2.1 Graphical trend display

Graphical trend display is one of the most basic and core functions of visual big data. By converting data sets into charts, such as line charts, bar charts, scatter plots, etc., visualization tools can clearly show trends in data over time or other variables. This graphical presentation makes complex data trends intuitive and easy to understand, thereby helping users quickly grasp the basic trends and key features of the data. In the field of education management, graphical trend display can be used in many aspects such as student performance analysis, teacher teaching effectiveness evaluation, and course popularity monitoring. For example, by comparing the line charts of student performance changes in different time periods, educational managers can promptly discover fluctuations in students' learning effectiveness, and thus adjust teaching strategies or provide personalized tutoring in a timely manner. In addition, graphical trends can also display data such as student attendance rates and frequency of classroom interactions, providing comprehensive support for educational management.

2.2 Multidimensional hierarchical correlation analysis

Another important function of visualizing big data is multidimensional hierarchical correlation analysis. This analysis method

allows users to explore and analyze data from multiple dimensions, revealing complex relationships and deep-seated patterns between data. In educational management, this means that students' multiple attributes (such as age, gender, social background) and learning behaviors (such as attendance, homework submission, test scores) can be considered at the same time, so as to gain more comprehensive and in-depth insight. For example, through multidimensional analysis, education administrators can identify which factors have the greatest impact on students' learning effectiveness, or which types of students are more likely to need additional support and resources. This analysis not only improves the dimension and depth of data analysis, but also makes decision-making more accurate and personalized.

2.3 Presentation of dynamic academic portraits

Dynamic academic portrait is an innovative application of visual big data in the field of education management. It collects and analyzes students' learning data to build a dynamically changing "portrait" that comprehensively reflects students' learning status and needs. This kind of portrait usually includes students' learning activity records, performance trends, interests and preferences, interactive participation and other aspects. It can provide teachers with the basis for personalized teaching and provide students with customized learning suggestions. For example, through dynamic academic portraits, teachers can monitor students' learning progress in real time, discover learning difficulties and challenges in a timely manner, and provide targeted tutoring and support. At the same time, this kind of portrait can also help educational managers better understand the overall learning status of student groups, optimize the allocation of teaching resources, and improve course design. The application of dynamic academic portraits not only enhances the pertinence and effectiveness of educational management, but also greatly improves the personalized level of educational services.

3. Application strategies of visual big data in education management

3.1 Analysis of teaching situation

In terms of learning performance analysis, visual big data can visually display students' performance distribution, performance change trends, and the relationship between performance and other factors (such as attendance rate, learning behavior) through charts and models. This information is critical for identifying patterns and trends behind academic performance and for making timely adjustments to teaching strategies. For example, educational managers can use visual analysis to discover that the performance of a certain subject or a certain type of students is generally low, so that they can take timely measures to intervene ^[2]. For the evaluation of teachers' teaching methods and effects, visual big data provides an objective and comprehensive evaluation tool. By analyzing various information such as classroom interaction data, student feedback, and homework scores, teachers' teaching effectiveness can be evaluated and possible improvements can be pointed out.

In terms of evaluating the suitability of course content, visual big data can show the correlation between course content and student learning outcomes, thereby helping educational managers evaluate the rationality and effectiveness of course settings. For example, analytical data might show that a certain course unit is associated with high student engagement and excellent performance, suggesting that the course unit's content and teaching methods are effective. Monitoring student engagement and interaction is another important application. By visualizing big data, educational managers can monitor students' interactions and participation in the classroom in real time to evaluate the attractiveness and participation of teaching activities.

3.2 Academic situation monitoring and early warning

The academic monitoring and early warning system can track students' learning progress and achievements in real time, and display students' learning achievements and progress speed through visual tools such as trend charts and heat maps. These visual displays help education administrators keep abreast of each student's learning status, especially those with low grades or slow progress. For example, the system can visually display the changing trend of student performance through color changes, and promptly identify students whose performance has declined so that timely intervention measures can be taken. In addition to monitoring academic performance, the academic monitoring and early warning system also pays attention to students' learning behavior and psychological state. By analyzing students' online learning behavior, class participation, social interaction and other information, the system can evaluate students' learning enthusiasm, participation and possible psychological problems.

The academic monitoring and early warning system can also predict students' future academic performance and behavioral trends based on historical data and current performance. This prediction is not only based on existing performance data, but may also include non-performance factors such as student participation and social activities. Through this prediction, educational administrators can foresee which students may encounter learning difficulties and prepare corresponding support measures in advance. An important feature of the academic monitoring and early warning system is its personalization and customization. The system can provide

targeted warnings and suggestions based on each student's specific situation.

3.3 Decision support services

Decision support services provide a comprehensive education management picture by integrating and analyzing various types of data from educational institutions (such as student performance, teacher effectiveness, resource allocation, curriculum, etc.). Through the visual display of these comprehensive data, education managers can clearly grasp the overall operating status of the school and identify strengths and weaknesses. For example, data visualization can help administrators discover which courses are popular with students and which teachers have outstanding teaching effects, thereby helping to optimize course settings and teacher training. In terms of resource allocation, decision support services can make recommendations based on data analysis [3]. By analyzing a school's funding flows, facility usage, and student needs, visual big data can guide administrators on how to allocate resources more efficiently.

Decision support services also include forecasting and planning of future trends. By analyzing historical data and current operating trends, visual big data can help educational managers predict future development directions, such as the increase or decrease in the number of students, the demand for emerging disciplines, etc. Such forecasts not only help with short-term decision-making, but are also critical for long-term planning. For example, through trend analysis, school administrators can plan ahead for the construction of new classroom buildings or adjust enrollment strategies for the next few years. Decision support services also emphasize the real-time and dynamic nature of data. In the context of the ever-changing educational environment, real-time updated data visualization provides continuous decision support, allowing administrators to respond quickly to various changes and challenges. For example, in the face of unexpected educational events or policy changes, managers can immediately analyze the impact through data visualization tools and adjust strategies accordingly.

Conclusion

With the continuous advancement of information technology and the increasing amount of educational data, the role of visual big data in educational management will become more prominent. It is not only a technical tool, but also an innovative management thinking and method, which provides strong support for improving the quality of education, optimizing resource allocation and adapting to educational changes. In the future, we look forward to more applications and explorations of visual big data in the field of education to promote educational progress and innovation.

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