

Research on Optimization Strategies for the Management and Maintenance of Educational Technology Equipment in Universities

Genyuan Wang

Hainan Vocational University of Science and Technology, Haikou, Hainan 571126

Abstract: With the advancement of information technology in higher education, educational technology equipment has become a core infrastructure for teaching, research, and management in universities. However, traditional manual management methods face challenges such as scattered equipment that is difficult to coordinate, imbalanced utilization, high maintenance costs, and delayed repair responses. This paper, based on the current status of educational technology equipment management in universities, proposes optimization strategies from four dimensions: daily management, maintenance systems, resource allocation, and personnel training. The goal is to improve equipment operational stability, reduce management costs, and ensure efficient teaching, providing a reference for equipment management practices.

Keywords: Educational technology equipment; Equipment management; Maintenance strategies

DOI:10.12417/3029-2328.25.11.026

1.Introduction

In the process of educational modernization, audiovisual teaching equipment is deeply integrated into classroom instruction, laboratory training, and academic activities in universities, and its operational status directly affects teaching quality and efficiency. With the expansion of university scale, the number of audiovisual teaching devices has increased, their types have diversified, and they are dispersed across multiple scenarios. The shortcomings of traditional management methods have become evident, such as failure to update ledgers in a timely manner leading to asset loss, repair responses occurring only after faults causing teaching interruptions, and the lack of scientific scheduling resulting in both device idleness and excessive wear. In this context, establishing an efficient and standardized management and maintenance system for audiovisual teaching equipment has become crucial for universities to ensure orderly teaching and optimize the allocation of educational resources. This article analyzes existing problems and, combined with practical needs, proposes optimization strategies to enhance management efficiency and extend equipment lifespan.

2.Analysis of the Current Situation of Management and Maintenance of Educational Technology Equipment in Universities

2.1 Equipment management is difficult, and overall efficiency is low.

University educational technology equipment exhibits the characteristics of variety, scattered distribution, and diverse scenarios. In terms of types, it includes basic teaching equipment such as projectors and audio systems, professional lab equipment such as film editing workstations, as well as meeting equipment like high-definition cameras and recording systems. In terms of distribution, it spans classrooms, laboratories, auditoriums, and offices across multiple campuses and floors, increasing the difficulty of management and coordination. Currently, most universities rely on traditional manual management. On the one hand, equipment ledgers are manually recorded, and information on procurement, allocation, and disposal must be entered by hand, which can easily result in omissions or errors, causing discrepancies between records and actual equipment; old equipment may not be promptly decommissioned, and new equipment is not managed uniformly. On the other hand, manual periodic inspections are limited by time and manpower, making it difficult to cover all areas, particularly overlooking potential risks in laboratory-specific equipment. Additionally, there is a lack of real-time tracking of equipment usage, leading to some equipment being privately used or idle, while urgently needed teaching equipment faces shortages, further reducing overall coordination efficiency.

2.2 Imbalance in equipment utilization,resulting in severe resource waste

Due to differences in teaching plans,varying needs of different majors,and imperfect scheduling mechanisms,the utilization of educational technology equipment in universities is uneven,resulting in serious resource waste.In terms of time slots,some equipment only serves specific courses or temporary events,such as end-of-semester lab training instruments or temporary conference recording equipment,and is stored unused for long periods,generating depreciation and maintenance costs without corresponding teaching benefits,leading to temporal idleness.In terms of location,equipment in classrooms for popular majors on the same campus is used for more than 8 hours daily,operating under high load for long periods,whereas equipment for less popular majors is used less than 2 hours,remaining largely idle,with a lack of cross-regional allocation mechanisms.In terms of function,some universities blindly purchase high-end equipment,such as 4K projectors or professional audio processors for ordinary classrooms,but only use basic functions in practice,leaving high performance unutilized and wasting procurement funds.

2.3 The maintenance system is not well-established,and the response cost is relatively high.

The current university educational equipment maintenance system faces three major problems:'passive maintenance,'multiple parties responsible,'and'uncontrolled costs,'leading to delayed maintenance response and high maintenance costs.In terms of maintenance response,users must report faults to administrators,who then coordinate with the maintenance team,resulting in multiple steps and long communication times;as a result,faults in core teaching equipment can easily disrupt teaching.In terms of fault diagnosis,maintenance personnel often lack professional skills and tools.When dealing with complex equipment such as virtual simulation experiment stations,the lack of specialized instruments and in-depth experience causes reliance on intuition,which can lead to misjudgments or repeated repairs,prolonging the maintenance cycle.Regarding cost control,the absence of preventive maintenance plans leads to equipment'running with issues,'turning minor faults into major problems and increasing maintenance costs.Additionally,irregular management of third-party service providers,inconsistent pricing,and lack of oversight can result in inflated project claims and higher prices for parts,further driving up maintenance costs.

2.4 There are deficiencies in personnel capabilities,and coordination between management and maintenance is weak.

The management and maintenance of educational technology equipment require both'management awareness'and'technical ability.'However,there are significant skill gaps among relevant personnel in universities,resulting in weak coordination between management and maintenance.Equipment administrators tend to focus on tasks such as record-keeping and scheduling coordination,without systematically learning equipment principles and troubleshooting knowledge.When faced with simple issues such as equipment failing to power on or loose wiring,they cannot handle them independently and must rely on professional maintenance personnel,which prolongs fault resolution time.The in-house maintenance team's professional structure is limited;they are only adept at maintaining basic equipment such as computers and projectors,and lack the capability to repair specialized equipment like post-production editing devices and interactive teaching all-in-one machines.Complex issues require third-party assistance,increasing communication costs and extending repair cycles.Moreover,teachers and students generally lack awareness of proper operation.Some,unfamiliar with procedures,often forcibly turn off projector power or accidentally delete system drivers,causing frequent equipment malfunctions,increasing the frequency of repairs,and adding to the burden of management and maintenance.

3.Optimization Strategies for the Management and Maintenance of Educational Technology Equipment in Universities

3.1 Standardize daily management and build an integrated system

Standardizing daily management requires building an integrated'ledger–scheduling–supervision'system.An electronic ledger system can be used to record the'full lifecycle'information of equipment,covering details such as

procurement parameters, usage areas and responsible personnel, maintenance records, and reasons for disposal. Administrators need to verify the ledger against actual equipment monthly to ensure that records match reality, while also marking outdated equipment used for more than five years and high-frequency equipment used for more than six hours daily, providing a basis for subsequent scheduling and updates. It is also necessary to formulate tiered scheduling rules based on the teaching plan and equipment requirements. Basic equipment should be implemented as campus-wide sharing and allocated in advance by administrators according to the course schedule; specialized equipment should be available for cross-discipline reservation through the teaching system's reservation channels; temporary equipment should establish an emergency scheduling pool with 1–2 spare units on standby. In addition, supervision should be strengthened through user registration and regular inspections, requiring users to fill out the Equipment Usage Record Form. Administrators should conduct weekly spot checks in key areas such as classrooms and laboratories to promptly identify unauthorized use and provide reminders for proper operation.

3.2 Improve the maintenance system to achieve closed-loop management

Improving the maintenance system requires the implementation of a closed-loop management of prevention–diagnosis–maintenance–supervision. Differentiated maintenance cycles should be established according to the type of equipment and its frequency of use. High-frequency equipment such as classroom projectors and laboratory computers should be maintained quarterly, including dust cleaning and inspection of circuits and performance. Medium-to low-frequency equipment, such as conference recording devices and specialized laboratory equipment, should be maintained every six months, focusing on storage conditions and component aging. Old equipment that has been in use for over five years should undergo simple monthly inspections to identify potential faults in advance. A tiered handling mechanism for faults should be established, where simple issues like loose wiring or failure to power on are handled on-site by administrators or department technical staff, while complex problems such as damage to core components are referred to the school maintenance team or a third party. At the same time, a fault case database should be created to categorize and record fault symptoms, causes, and solutions.

3.3 Optimize resource allocation, and purchase and update scientifically

Develop procurement plans scientifically. Before purchasing, work jointly with the Academic Affairs Office and various departments to conduct needs surveys, gather data on the teaching requirements of different majors, and clarify the types, quantities, and functional requirements of equipment, such as whether interactive features are needed and whether it is compatible with existing teaching systems. Refer to equipment usage frequency data to avoid situations where high-spec equipment with low demand is purchased, such as 4K editing workstations for non-film majors. Prioritize brands with high cost performance and fast after-sales response to shorten subsequent maintenance cycles. Plan equipment updates reasonably based on the equipment's lifespan and performance degradation. Dispose of and update equipment that has been in use for over five years, has maintenance costs exceeding 50% of the original value, or cannot meet current teaching needs, such as outdated CRT projectors. For equipment used for 5–8 years with core functions intact but experiencing slow performance, such as computers, extend their lifespan and reduce update costs by upgrading components like adding memory or replacing the hard drive with a solid-state drive.

3.4 Strengthen personnel capabilities and establish a training system

Strengthening personnel capabilities requires building a "Administrator–Maintenance Staff–Teachers and Students" training system. Regular training sessions for administrators should cover basic principles of equipment such as projector optical systems and interactive whiteboard touch technology, troubleshooting common issues like device networking and audio problems, as well as the operation of electronic ledger systems. Administrators are encouraged to participate in industry exchanges in higher education equipment management to learn advanced practices. For maintenance staff, technical personnel from equipment manufacturers should be invited to provide specialized training on interactive all-in-one machines, virtual simulation equipment, and other devices. They should

also be arranged to attend multimedia equipment maintenance certification courses. A "mentorship" mechanism should be established, with experienced staff guiding new members in hands-on practice. For teachers and students, incorporate the operation of educational technology equipment into the orientation for new students, explaining basic operations through videos and live demonstrations; each department organizes one to two professional equipment training sessions per semester, such as operating specialized laboratory audio-visual equipment; place simple flowcharts next to the equipment, indicating the steps for use and the method for reporting malfunctions, to standardize the operation by teachers and students.

4. Conclusion

Management and maintenance of educational technology equipment in universities is an important link in ensuring teaching order and optimizing educational resources. Currently, universities need to break through the limitations of traditional management models by building an integrated management system, improving the maintenance closed-loop, scientifically allocating resources, and strengthening personnel capabilities to enhance equipment operational stability and usage efficiency. In the future, with the development of educational informatization, universities can introduce the Internet of Things and intelligent monitoring tools to promote equipment management toward "proactive warning and intelligent scheduling," providing equipment support for the high-quality development of higher education.

References:

- [1] Zhang Yuwen. Analysis of the Advantages, Challenges, and Optimization Paths of Multimedia Teaching in Universities under the New Situation[J]. *Journal of Heilongjiang Teachers Development College*, 2022, 41(08): 48-50.
- [2] Yang Ming. Research on Common Faults and Maintenance of Electronic Teaching Equipment in University Multimedia Classrooms[J]. *Journal of Science and Technology Innovation Herald*, 2020, 17(13): 144-145.
- [3] Xu Xiaoyan. Exploration of the Construction of Smart Classrooms in Universities Based on Multimedia Teaching Technology[J]. *Journal of Hubei Open Vocational College*, 2023, 36(23): 144-146, 149.