ANTHROPOLOGICAL NOTEBOOKS
ISSN / eISSN 1408-032X
Publisher SLOVENE ANTHROPOLOGICAL SOC, FAK SPORT, GORTANOVA 22, LJUBLJANA, SLOVENIA, SI-1000
Volume 26-Issue 1-(2026)
DOI:doi.org/10.65613/743929

Technological Empowerment and Institutional Optimization: Investigating the Synergistic Impacts of AI Auxiliary Tools and Standardized Flexible Work Policies on Multi-faceted Work Productivity of Educational Practitioners With Flexible Work Policies as a Partial Mediator

Sha He*
School of Marxism, Wuhan Donghu University, Wuhan 430212, Hubei Province, China
hanna0098@163.com

Abstract

The rapid digital transformation of the global education sector has profoundly reshaped occupational workflows, institutional operational paradigms, and workplace environments for educational practitioners. Driven by intelligent education reform and post-pandemic workplace restructuring, the integrated deployment of artificial intelligence (AI) tools and standardized flexible work policies (FWP) has emerged as two core driving forces for optimizing institutional operations and boosting employee work efficiency in educational contexts. This study systematically examines the independent and synergistic impacts of AI tool integration and flexible work policies on multi-dimensional employee productivity across teaching and administrative staff in educational institutions. Adopting a quantitative explanatory research design, this paper aims to clarify the causal relationships between technological empowerment, institutional policy optimization, and employee productivity growth. The AI tools investigated in this research cover five mainstream intelligent educational and auxiliary office platforms, including ChatGPT, Gamma, Grammarly, Scholarcy, and Turnitin, which are widely deployed for instructional design, academic research, textual optimization, academic norm verification, and administrative document processing. Flexible work policies in this study primarily encompass flexible working hour arrangements and hybrid work models that integrate offline on-site duties and online remote work. Based on valid empirical data collected from 426 frontline teachers and administrative personnel across primary, secondary, and tertiary educational institutions, this research constructs a multi-dimensional productivity evaluation framework covering teaching methodology innovation, administrative operational efficiency, academic research output, and long-term work sustainability. Multiple regression analysis and mediation effect testing are employed to elucidate the independent influence pathways of AI tools and flexible work

policies on educational employee productivity, as well as their interactive synergistic mechanisms. The empirical results demonstrate that both AI tool application and standardized FWP implementation exert significant positive predictive effects on overall employee productivity in the education sector. AI tools enhance work productivity predominantly by automating repetitive procedural tasks, streamlining teaching and research workflows, and improving work accuracy and standardization, whereas flexible work policies facilitate efficiency gains through rational time allocation optimization, reduction of invalid commuting costs, and improvement of work-life balance. Furthermore, flexible work policies exert a significant positive partial mediating effect on the relationship between AI tool application and employee productivity, enabling educational practitioners to fully leverage the intelligent auxiliary value of AI tools in diversified work scenarios. Meanwhile, this study identifies several practical constraints hindering synergistic empowerment, including uneven proficiency in AI tool adoption among employees, imperfect institutional governance mechanisms for flexible work, and potential productivity differentiation risks induced by excessive work flexibility. Methodologically and theoretically, this study innovatively integrates technological empowerment and institutional optimization perspectives to explore the productivity improvement mechanisms of educational employees, filling the prominent research gap regarding synergistic analysis of AI technology and flexible work policies in educational productivity research. The findings provide empirical evidence and actionable optimization strategies for educational institutions to promote standardized intelligent technology application, formulate scientific flexible work management systems, and achieve high-quality improvement in comprehensive employee productivity.

Keywords: Artificial Intelligence; Flexible Work Policies; Employee Productivity; Educational Sector; Teaching Efficiency; Administrative Operation; Work Synergy

1. Introduction

1.1 Research Background

The global education industry is undergoing an unprecedented intelligent and digital transformation fueled by iterative generative artificial intelligence innovations and modern human resource management paradigms. In recent years, the continuous upgrading of generative AI and intelligent office technologies has comprehensively penetrated core educational scenarios, including instructional practice, academic research, and institutional administrative operations, fundamentally revolutionizing traditional working modes and workflow systems for educational employees. Concurrently, the widespread adoption of hybrid work models and the iterative optimization of institutional human resource management systems have rendered flexible work policies a pivotal institutional arrangement for enhancing organizational operational efficiency and employee occupational well-being. The dual structural changes of technological iteration and institutional reform have profoundly reshaped the productivity level and occupational development status of teaching and administrative staff, emerging as a critical research agenda in the fields of modern educational management and educational technology.

Employee productivity in the education sector exhibits distinct multi-dimensional, procedural, and intellectual attributes that differentiate it from conventional industrial and commercial

productivity metrics. The occupational duties of educational practitioners integrate innovative instructional design, standardized student cultivation, professional academic inquiry, and repetitive daily administrative operations, requiring both high-level intellectual output and rigorous procedural execution. For decades, productivity stagnation among educational employees has been constrained by two core bottlenecks. First, educational work entails substantial repetitive and standardized tasks, including textual revision, academic authenticity detection, document sorting, and teaching resource development, which consume massive working time and energy and hinder high-value intellectual work such as pedagogical innovation and academic research. Second, the traditional fixed-time and fixed-location working regime adopted by most educational institutions leads to rigid time allocation, excessive invalid commuting costs, and imbalanced work-life boundaries, thereby inducing occupational burnout, reducing work motivation, and restricting the sustainable improvement of comprehensive work productivity.

With the maturity and popularization of generative AI technology, intelligent tools represented by ChatGPT, Gamma, Grammarly, Scholarcy, and Turnitin have become prevalent in the daily work of educational practitioners. ChatGPT provides intelligent assistance for instructional scheme design, lesson planning optimization, and academic problem analysis; Gamma enables rapid generation and intelligent optimization of teaching courseware and academic presentation slides; Grammarly delivers high-precision grammatical detection and academic writing standardization; Scholarcy facilitates efficient literature screening, academic content extraction, and research framework refinement; Turnitin realizes standardized academic plagiarism detection and normative inspection. These AI tools effectively compensate for the inherent inefficiencies of traditional manual workflows, automate repetitive educational procedural tasks, and provide robust technical support for employee productivity enhancement. At the institutional management level, an increasing number of educational institutions have implemented flexible work policies covering flexible working hours and hybrid work arrangements, breaking the institutional shackles of traditional fixed work regimes. Flexible work mechanisms empower employees to independently allocate working time and select work scenarios based on task characteristics and personal conditions, effectively reducing invalid time consumption, optimizing work rhythms, and improving occupational autonomy and flexibility.

Although existing literature has independently verified the positive effects of AI technology application and flexible work policies on educational operational efficiency, most prior studies adopt a single-factor analytical perspective and lack systematic exploration of their synergistic interactive mechanisms. In practical educational management scenarios, the intelligent empowerment of AI technology relies heavily on flexible work scenarios and autonomous time allocation to maximize its technical value; meanwhile, the productivity benefits of flexible work policies are dependent on intelligent technical tools to support efficient remote and flexible task execution. Currently, empirical quantitative research exploring the causal relationships and synergistic mechanisms between the two variables and multi-dimensional educational employee productivity remains scarce, and their differential influence pathways and practical application risks have not been fully elucidated. This research gap restricts the scientific formulation of intelligent transformation strategies and human resource optimization schemes for modern educational institutions. Against this practical and theoretical backdrop, this study conducts quantitative explanatory research to

explore the impact of AI tool application and flexible work policies on educational employee productivity, aiming to provide empirical evidence and practical guidance for the high-quality development of modern education systems.

1.2 Research Significance

1.2.1 Theoretical Significance

This study delivers significant theoretical innovations and supplementary values to the domains of educational technology, educational management, and organizational human resource management. First, departing from the single-factor research limitations of existing studies, this study constructs an innovative "technology-institution-productivity" synergistic theoretical framework that takes AI intelligent technology application and flexible work institutional arrangement as dual core variables, enriching the theoretical system of educational employee productivity improvement. Second, this study refines educational productivity into multi-dimensional indicators encompassing teaching methodology innovation efficiency, administrative operational efficiency, academic research output, and work sustainability, realizing refined quantitative measurement and compensating for the single-dimensional evaluation defects of traditional productivity research. Third, this study verifies the mediating effect of flexible work policies on the relationship between AI tool application and employee productivity, clarifying the internal synergistic logic between technological empowerment and institutional optimization and providing a novel theoretical perspective for interdisciplinary integration research of AI technology and educational human resource management. Additionally, the research findings expand the application boundary of flexible work theory in specialized educational scenarios and provide theoretical references for subsequent related interdisciplinary studies.

1.2.2 Practical Significance

This study provides targeted practical guidance and scientific decision-making references for educational institutions to optimize work management modes and enhance comprehensive employee productivity. For institutional administrators, the findings clarify the independent application value and synergistic advantages of AI tools and flexible work policies, enabling the scientific formulation of intelligent transformation and flexible management optimization strategies, avoidance of blind technological investment and excessive policy flexibility risks, and precise matching of technical resources and institutional systems. For frontline teaching and administrative practitioners, this study clarifies the optimal application scenarios and efficiency improvement pathways of mainstream AI tools, assisting employees in standardizing intelligent tool adoption to reduce workload and improve work quality, and guiding rational utilization of flexible work systems to optimize personal work rhythms and balance occupational and personal life. For the entire education industry, this research establishes a replicable and scalable optimization paradigm for intelligent upgrading and humanized management of modern educational institutions, helping alleviate the prevalent problems of employee burnout and low work efficiency, and promoting the sustainable and high-quality development of educational undertakings.

1.3 Research Objectives and Research Questions

1.3.1 Research Objectives

This study establishes four core research objectives. First, to systematically sort out the current status of mainstream AI tool application and flexible work policy implementation in modern educational institutions, and construct a standardized multi-dimensional evaluation index system for AI tool application level, flexible work policy effectiveness, and educational employee productivity. Second, to quantitatively analyze the independent impacts of AI tool application and flexible work policies on multi-dimensional employee productivity, and clarify the positive promotion effects and practical limitations of the two core variables. Third, to explore the interactive synergistic effects and mediating mechanisms between AI tool application and flexible work policies in shaping employee productivity, and reveal the internal logical pathways of technology-institution synergistic empowerment. Fourth, to summarize the practical constraints in the integrated application of AI tools and flexible work policies in educational scenarios, and propose targeted optimization strategies to enhance comprehensive employee productivity.

1.3.2 Research Questions

Corresponding to the above research objectives, this study focuses on three core research questions for empirical analysis: (1) What are the independent effects of mainstream AI tool application (ChatGPT, Gamma, Grammarly, Scholarcy, Turnitin) and flexible work policies (flexible working hours, hybrid work models) on the multi-dimensional productivity (teaching innovation efficiency, administrative operational efficiency, academic research output, work sustainability) of educational employees? (2) Is there a significant synergistic interaction effect between AI tool application and flexible work policies, and do flexible work policies exert a mediating effect on the association between AI tool application and educational employee productivity? (3) What practical challenges restrict the synergistic empowerment of AI technology and flexible work policies in the education sector, and what targeted optimization measures can maximize employee productivity improvement?

1.4 Research Innovation Points

This study presents three substantial innovations compared with extant domestic and foreign literature. First, the research perspective is innovative. Most prior studies focus solely on the single impact of AI technology or flexible work policies on organizational efficiency, while this study integrates technological empowerment and institutional optimization perspectives to construct a dual-variable synergistic analytical framework, revealing the interactive mechanism between technology and institutional systems in educational work scenarios and filling the single-dimensional perspective research gap. Second, the indicator system is innovatively refined. Targeting the unique occupational attributes of educational employees, this study subdivides AI tools into five mainstream application categories and employee productivity into four professional dimensions, achieving more targeted and refined quantitative evaluation than general industrial productivity research. Third, the research conclusions possess practical innovation. Beyond verifying the positive productivity-

enhancing effects of the two core variables, this study identifies potential risks including uneven AI proficiency and efficiency loss caused by excessive work flexibility, and proposes localized optimization strategies tailored to educational industry characteristics, delivering stronger practical guiding value than conventional generic research findings.

2. Literature Review and Research Hypotheses

2.1 Research on AI Technology Application in the Education Sector

Driven by generative AI technological progress, intelligent tool application has been widely popularized in global educational scenarios, becoming a core technical support for educational digital transformation and employee work efficiency improvement. Foreign scholars have conducted extensive empirical research on the application value of AI tools in educational occupational scenarios. Reddy and Leelavathi (2025) [1] demonstrate that AI intelligent tools can effectively automate repetitive educational tasks such as student grading, teaching feedback generation, and teaching resource classification, significantly reducing the auxiliary workload of educational practitioners and allowing employees to concentrate on high-value innovative teaching and research work. Evelyn (2026) [2] empirically verifies that standardized AI auxiliary tools can reduce teachers' daily workload by an average of 40%, while intelligent grading systems can save 80% of manual grading time, effectively alleviating occupational burnout and improving work efficiency. AIQ Labs (2026) [3] further highlights that comprehensive AI tool deployment can save educators 20 to 40 hours of invalid working time weekly, fundamentally mitigating the efficiency bottlenecks caused by excessive trivial administrative work in the education industry.

In terms of segmented tool application scenarios, extant studies have confirmed the targeted efficiency-enhancing value of mainstream AI tools in educational work. ChatGPT exhibits prominent advantages in instructional scheme design, personalized teaching planning, and academic problem analysis, enabling teachers to rapidly optimize pedagogical frameworks and enrich teaching content. Gamma supports the intelligent and rapid generation of teaching courseware and academic presentation materials, resolving the drawbacks of long production cycles and single forms in traditional teaching auxiliary resource development. Grammarly significantly improves the textual standardization and academic writing quality of educational practitioners' teaching documents and research papers, reducing manual revision costs. Scholarcy enhances the efficiency of literature collation and research framework construction, providing robust support for academic output. Turnitin standardizes academic detection procedures, effectively preventing academic irregularities and improving the normative level of educational and research work.

Domestic research on educational AI application predominantly focuses on teaching scenario innovation and educational resource optimization, confirming that AI technology can reshape traditional pedagogical modes, realize personalized instructional design and intelligent teaching management, and improve the overall operational efficiency of educational institutions. However, most domestic studies prioritize student learning outcome optimization, with limited quantitative research focusing on AI tools' impact on employee

occupational productivity, and few refined analyses exploring the differential effects of diverse AI tools on multi-dimensional educational productivity. Based on the above literature review, this study posits that standardized application of mainstream AI tools can effectively optimize educational work workflows, reduce repetitive workloads, and improve multi-dimensional work efficiency. Accordingly, the first research hypothesis is proposed:

H1: AI tool application has a significant positive impact on the overall productivity and multi-dimensional productivity (teaching efficiency, administrative efficiency, research output, work sustainability) of employees in the education sector.

2.2 Research on Flexible Work Policies and Employee Productivity

Flexible work policies represented by flexible working hours and hybrid work models have emerged as crucial modern human resource management systems widely adopted by global enterprises and public institutions, with their productivity implications remaining a hot topic in organizational management research. Traditional fixed work systems show prominent limitations in modern educational scenarios. Fixed working hour regimes lead to rigid time allocation, while mandatory on-site work arrangements generate excessive invalid commuting costs and occupational constraints, resulting in low work autonomy and imbalanced work-life relationships, which hinder the sustainable improvement of employee productivity.

Extant foreign empirical studies have fully validated the positive productivity-enhancing value of flexible work policies. Flexible working hour arrangements enable employees to independently adjust work schedules according to task urgency and personal work habits, stimulating autonomous work motivation and improving occupational concentration. Hybrid work models, which integrate online remote work and offline on-site work, can flexibly adapt to the diversified task attributes of educational work. Standardized administrative processing and literature collation can be efficiently completed via remote work, while offline classroom teaching and student interactive guidance require on-site attendance to guarantee service quality. Empirical evidence indicates that scientific flexible work policies can effectively reduce employee occupational pressure, alleviate job burnout, improve job satisfaction and organizational commitment, and ultimately promote the enhancement of comprehensive work productivity.

Domestic educational management research also indicates that the rigid traditional work system of educational institutions is a key factor restricting employee work efficiency. Rational flexible work reform can break the institutional shackles of fixed work time and scenarios, optimize employee work rhythms, and release occupational potential. Nevertheless, several studies have noted the dual attributes of flexible work: excessive flexibility may lead to blurred work-life boundaries, reduced team collaboration efficiency, and dispersed work attention, thereby triggering potential productivity decline. Overall, standardized and scientific flexible work policies can effectively optimize the occupational state of educational employees and improve work efficiency. On this basis, the second research hypothesis is formulated:

H2: Standardized implementation of flexible work policies (flexible working hours, hybrid

work) has a significant positive impact on the overall productivity and multi-dimensional productivity of employees in the education sector.

2.3 Synergistic Mechanism of AI Technology and Flexible Work Policies

AI technology application and flexible work policies possess inherent logical correlation and complementary synergies in educational work scenarios. On the one hand, efficient AI tool deployment relies on flexible work scenarios and autonomous time allocation as institutional support. Traditional fixed on-site work modes and rigid working hour systems restrict the flexible and diversified application of intelligent tools. Flexible work policies empower employees to independently arrange work time and scenarios, freely deploying diverse AI tools to match task demands and maximize the intelligent efficiency advantages of AI technology. On the other hand, the stable implementation of flexible work policies requires AI intelligent tools as technical support. Hybrid remote work and flexible time arrangements lead to decentralized work scenarios and diversified task structures, while AI tools enable efficient remote task processing, standardized work management, and real-time operational feedback, effectively resolving efficiency losses and management loopholes caused by work flexibility.

Existing organizational management studies have confirmed significant complementary synergies between digital technology application and flexible work systems in modern institutional operations. In specialized educational scenarios, AI tools realize the intelligence and automation of repetitive work procedures, while flexible work policies achieve humanized and autonomous work management. The integration of the two forms a virtuous cycle of "technological efficiency improvement + institutional vitality activation", jointly driving the sustainable growth of employee productivity. However, prior literature lacks quantitative empirical analysis of their synergistic mechanisms in the education sector, and the mediating effect of flexible work policies on the AI-productivity linkage remains underexplored. Based on the above theoretical logic and empirical foundations, the third research hypothesis is proposed:

H3: Flexible work policies play a significant positive mediating role in the impact of AI tool application on employee productivity in the education sector. AI tool application can indirectly improve employee productivity by optimizing the implementation effect of flexible work policies.

2.4 Research Theoretical Model

Based on the above research hypotheses and literature synthesis, this study constructs a dual-factor synergistic theoretical model encompassing AI tool application, flexible work policies, and educational employee productivity. In this model, AI tool application serves as the independent variable, covering the comprehensive adoption level of ChatGPT, Gamma, Grammarly, Scholarcy, and Turnitin; flexible work policies function as both an independent variable and a mediating variable, including flexible working hour arrangement and hybrid work model implementation; employee productivity acts as the dependent variable, consisting of four dimensions: teaching methodology innovation efficiency, administrative

operational efficiency, academic research output, and work sustainability. This model focuses on verifying the independent influence effects of the two core variables and their mediating synergistic mechanisms, so as to systematically clarify the multi-dimensional influence pathways of technology and institution on educational employee productivity.

3. Research Methodology

3.1 Research Design

This study adopts a quantitative explanatory research design, targeting frontline teachers and administrative staff from primary, secondary, and tertiary educational institutions, and utilizing questionnaire surveys for empirical data collection. Multiple statistical analysis methods, including descriptive statistics, correlation analysis, multiple linear regression analysis, and mediating effect testing, are applied to verify the research hypotheses and theoretical model. The explanatory research design is adopted to explore the causal relationships between AI tool application, flexible work policies, and employee productivity, and clarify the internal variable influence mechanisms, which fits the core research purpose of quantitative causal inference. All questionnaire items are adapted from mature domestic and international scales and revised according to the occupational characteristics of educational employees, ensuring the reliability and validity of the research instrument.

3.2 Variable Measurement

3.2.1 Independent Variable: AI Tool Application (AITA)

This variable measures the comprehensive application level of mainstream AI intelligent tools among educational employees, covering five sub-dimensions corresponding to ChatGPT, Gamma, Grammarly, Scholarcy, and Turnitin. The measurement items assess the usage frequency, operational proficiency, and practical efficiency improvement effects of each AI tool in daily teaching, administrative, and academic research work. All items adopt a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), with higher scores indicating higher overall AI tool application proficiency and better technical empowerment effectiveness.

3.2.2 Mediating Variable: Flexible Work Policies (FWP)

This variable evaluates the practical implementation effectiveness of flexible work systems in educational institutions, including two core sub-dimensions: flexible working hour arrangement and hybrid work model deployment. The items investigate the rationality of institutional flexible work system design, the autonomy of employees' work schedule and scenario arrangement, and the practical implementation outcomes of flexible policies. A 5-point Likert scale is uniformly adopted, with higher scores representing more standardized flexible work policy implementation and higher occupational flexibility.

3.2.3 Dependent Variable: Employee Productivity (EP)

Combined with the multi-dimensional intellectual occupational characteristics of educational employees, this study divides employee productivity into four refined sub-dimensions: teaching methodology innovation efficiency (TMIE), administrative operational efficiency (AOE), academic research output (ARO), and work sustainability (WS). TMIE measures the optimization level of instructional design, pedagogical innovation, and classroom teaching effectiveness; AOE evaluates the speed, quality, and standardization of daily administrative task processing; ARO assesses the quantity and quality of academic achievements and research innovation capacity; WS reflects employees' occupational persistence, anti-burnout ability, and long-term productivity stability. All dimensional indicators are measured via a 5-point Likert scale.

3.2.4 Control Variables

To eliminate the confounding effects of individual demographic characteristics on empirical results and ensure the accuracy and robustness of the regression model, this study selects gender, age, working tenure, educational background, and institutional type as control variables in all subsequent analyses.

3.3 Data Collection

Research data is collected via anonymous online questionnaire surveys targeting frontline teachers and administrative staff from multiple regional primary, secondary, and tertiary educational institutions. The questionnaire consists of four modules: basic demographic information, AI tool application status, flexible work policy implementation status, and multi-dimensional employee productivity evaluation. Prior to formal data collection, the questionnaire is revised and polished by educational management and educational technology experts to ensure item rationality, pertinence, and content validity. The formal survey lasts 15 days, yielding 458 raw questionnaires. After screening out invalid responses with regular answering patterns, missing core information, or logical contradictions, 426 valid samples are retained, representing an effective response rate of 92.99%. The sample covers diverse age groups, working tenures, educational backgrounds, and institutional types, ensuring good representativeness for statistical analysis.

3.4 Data Analysis Method

All data sorting and empirical analyses in this study are conducted using SPSS 26.0 statistical software. The analytical procedures include four sequential steps: first, reliability and validity tests verify the internal consistency of the scale and the structural validity of the theoretical model; second, descriptive statistical analysis and Pearson correlation analysis clarify sample distribution characteristics and preliminary variable correlations; third, multiple linear regression analysis tests the independent influence of core variables on employee productivity; fourth, hierarchical regression analysis examines the mediating effect of flexible work policies to systematically clarify the synergistic interaction mechanisms between variables.

4. Empirical Results and Analysis

4.1 Reliability and Validity Test

Reliability test results demonstrate that the overall Cronbach's α coefficient of the questionnaire scale is 0.896, and the α coefficients of all sub-dimensional scales exceed 0.8, indicating excellent internal consistency reliability and stable measurement results. Validity test results show that the overall KMO value is 0.872, and the Bartlett sphericity test reaches statistical significance ($p < 0.001$), satisfying the prerequisites for exploratory factor analysis. Confirmatory factor analysis further verifies the good structural validity of the theoretical model, with all model fitting indices within the ideal threshold range, confirming that the research data is suitable for subsequent hypothesis testing.

4.2 Descriptive Statistical Analysis

Sample demographic statistics show that female employees account for 62.44% and male employees account for 37.56%, consistent with the gender distribution characteristics of the global education industry. In terms of age structure, employees aged 25–35 constitute the main occupational group, accounting for 58.22% of the total sample. In terms of working tenure, employees with 1–10 years of work experience account for 65.73%, covering novice and experienced practitioners. In terms of institutional types, primary and secondary school staff account for 53.05%, and university staff account for 46.95%, achieving full coverage of basic and higher education scenarios. Descriptive statistics of core variables reveal that the mean values of AI tool application, flexible work policies, and employee productivity range from 3.2 to 4.1, indicating a medium-to-high overall level of AI adoption and flexible work implementation in educational institutions, with stable employee productivity, which meets the requirements for regression analysis.

4.3 Correlation Analysis

Pearson correlation analysis results indicate significant positive correlations between all core variables. Specifically, AI tool application is positively correlated with flexible work policies ($r = 0.582$, $p < 0.001$). AI tool application shows significant positive correlations with overall employee productivity and all sub-dimensions ($r = 0.615, 0.593, 0.602, 0.578, 0.566$, all $p < 0.001$). Similarly, flexible work policies are significantly positively correlated with overall employee productivity and each sub-dimension ($r = 0.543, 0.521, 0.537, 0.512, 0.508$, all $p < 0.001$). These preliminary correlation results provide a valid foundation for subsequent regression hypothesis testing.

4.4 Regression Analysis and Hypothesis Testing

4.4.1 Independent Impact of AI Tool Application on Employee Productivity

Controlling for demographic variables, multiple linear regression results demonstrate that AI tool application exerts a significant positive predictive effect on overall employee productivity ($\beta = 0.482$, $p < 0.001$). For sub-dimensional productivity indicators, AI tool application significantly and positively predicts teaching methodology innovation efficiency ($\beta = 0.465$, p

< 0.001), administrative operational efficiency (β = 0.491, p < 0.001), academic research output (β = 0.453, p < 0.001), and work sustainability (β = 0.442, p < 0.001). These results fully validate Hypothesis H1, confirming that standardized mainstream AI tool application can comprehensively improve the multi-dimensional work productivity of educational employees. AI tools effectively optimize pedagogical innovation levels, reduce administrative workload pressure, enhance academic research efficiency, and alleviate occupational burnout, realizing comprehensive technical empowerment for educational work.

4.4.2 Independent Impact of Flexible Work Policies on Employee Productivity

Multiple regression analysis is also conducted with flexible work policies as the independent variable. The results show that flexible work policies significantly positively predict overall employee productivity (β = 0.415, p < 0.001). In terms of sub-dimensions, flexible work policies exert significant positive predictive effects on teaching methodology innovation efficiency (β = 0.392, p < 0.001), administrative operational efficiency (β = 0.408, p < 0.001), academic research output (β = 0.385, p < 0.001), and work sustainability (β = 0.421, p < 0.001). These findings verify Hypothesis H2, indicating that scientific flexible working hour arrangements and hybrid work models can effectively optimize the occupational state of educational employees, improve work autonomy and time utilization efficiency, and further enhance multi-dimensional work productivity. Notably, flexible work policies show the most prominent improvement effect on work sustainability, demonstrating that flexible institutional arrangements can effectively balance employees' work and life, reduce occupational pressure, and enhance long-term work persistence.

4.4.3 Mediating Effect Test of Flexible Work Policies

This study adopts the classic hierarchical regression method to test the mediating effect of flexible work policies. The mediating effect verification follows three standard steps: first, the independent variable significantly predicts the dependent variable; second, the independent variable significantly predicts the mediating variable; third, after incorporating the mediating variable into the regression model, the predictive coefficient of the independent variable on the dependent variable decreases but remains statistically significant, confirming a partial mediating effect. The empirical results show that after adding flexible work policies as the mediating variable, the regression coefficient of AI tool application on employee productivity decreases from 0.482 to 0.316 (p < 0.001), while the regression coefficient of flexible work policies on employee productivity is 0.352 (p < 0.001). This outcome confirms a significant partial mediating effect of flexible work policies on the AI tool application–employee productivity linkage, thus fully validating Hypothesis H3.

The mediating effect results reveal the dual influence pathways of AI tool application on employee productivity: AI technology can not only directly boost educational employee productivity through workflow optimization and workload reduction, but also indirectly improve productivity by optimizing the practical implementation effectiveness of flexible work policies. AI intelligent tools provide solid technical support for efficient flexible remote work and autonomous time scheduling, enhancing the operability and efficiency of flexible work systems; in turn, flexible work institutions release employees' occupational autonomy,

enabling them to fully exploit the technical advantages of AI tools in diversified work scenarios and form a virtuous synergistic empowerment loop of technology and institution.

5. Discussion

5.1 Independent Empowerment Mechanism of AI Tools on Educational Employee Productivity

Consistent with the core conclusions of Reddy and Leelavathi (2025) [1] and Evelyn (2026) [2], this study confirms that mainstream AI tools including ChatGPT, Gamma, Grammarly, Scholarcy, and Turnitin deliver comprehensive multi-dimensional productivity empowerment for educational employees. In terms of teaching efficiency, ChatGPT's intelligent instructional design assistance and Gamma's rapid courseware generation function break the time and resource constraints of traditional manual lesson preparation, greatly reducing teachers' instructional design cycle and freeing up more time for pedagogical innovation and personalized student guidance. In terms of administrative operational efficiency, AI tool automation optimizes repetitive tasks such as textual revision, document sorting, and academic detection, resolving the low-efficiency dilemma caused by massive trivial administrative work and improving the standardization and refinement of institutional daily operations.

In terms of academic research output, Scholarcy's intelligent literature mining and framework sorting functions combined with Grammarly's standardized textual optimization effectively reduce the time cost and technical threshold of academic writing, improving the quantity and quality of educational employees' academic achievements. In terms of work sustainability, AI tool application significantly reduces employees' repetitive labor pressure and invalid workload, alleviating the prevalent occupational burnout phenomenon in the education industry, improving job satisfaction and organizational commitment, and ensuring the long-term stability of work efficiency. Different from prior single-effect research, this study further refines the differential empowerment advantages of diverse AI tools in segmented educational work scenarios, achieving a more precise understanding of AI technical value in educational contexts.

5.2 Productivity Optimization Mechanism of Flexible Work Policies

This study empirically validates the positive productivity optimization effect of flexible working hour arrangements and hybrid work models on educational employees, confirming the value of humanized flexible management in educational human resource optimization. Traditional fixed work systems with rigid time and scenario constraints fail to adapt to the diversified intellectual work attributes of modern educational occupations, which integrate fixed-scene offline teaching and flexible-scene research and administrative work. Flexible work policies enable employees to match different task types with optimal working time and scenarios: offline interactive teaching and student guidance are completed on-site to guarantee service quality, while academic research and administrative sorting tasks are processed via remote flexible work to improve time utilization efficiency.

Flexible working hour arrangements break rigid time constraints, allowing employees to arrange high-concentration intellectual work such as pedagogical innovation and academic research during their personal efficient working periods, thereby improving core work quality and output efficiency. Hybrid work models eliminate daily commuting time and invalid occupational constraints, optimize work-life balance, reduce emotional exhaustion and occupational pressure, and significantly enhance long-term work sustainability. Furthermore, flexible work systems strengthen employees' perceived organizational trust and occupational autonomy, stimulating proactive work motivation and innovative willingness, and further promoting the improvement of teaching innovation efficiency and academic research output. The prominent effect of flexible policies on work sustainability also explains the effectiveness of flexible management in alleviating the widespread teacher burnout crisis in modern education.

5.3 Synergistic Mediating Mechanism of Technology and Institution

The innovative mediating effect findings of this study clarify the internal synergistic mechanism between AI tool application and flexible work policies, filling the research gap of insufficient technology-institution interactive analysis in existing educational productivity studies. AI intelligent technology serves as the core technical foundation for efficient flexible work implementation. Flexible hybrid work leads to decentralized work scenarios and diversified task structures, which cannot be efficiently managed via traditional manual work modes. AI tools realize remote intelligent office automation, standardized task management, and real-time operational feedback, effectively solving the problems of low communication efficiency and non-standard workflows in flexible work scenarios and ensuring the orderly implementation of flexible work arrangements.

Conversely, flexible work policies provide the essential institutional guarantee for maximizing AI technical empowerment value. Traditional fixed on-site work modes restrict the flexible and diversified application of AI tools, while autonomous time and scenario selection under flexible work systems enable employees to deploy diverse AI tools according to personalized task demands, fully releasing AI's advantages in workflow optimization and workload reduction. The synergistic interaction between AI technology and flexible work policies forms a dual-driven productivity improvement mechanism of "technological empowerment + institutional activation", which effectively breaks the efficiency bottlenecks of traditional educational work modes and management systems and promotes the high-quality development of institutional operations and employee productivity.

5.4 Practical Constraints and Potential Risks

Beyond the positive synergistic empowerment effects, this study also identifies prominent practical constraints and potential risks in the integrated application of AI tools and flexible work policies in the education sector. First, significant individual differences exist in employees' AI tool application proficiency. Elderly and tenured employees generally have insufficient mastery of intelligent tools, failing to fully leverage AI technical advantages to improve work efficiency and resulting in productivity differentiation among institutional staff.

Second, some educational institutions lack standardized flexible work management systems and scientific supervision and assessment mechanisms, which may lead to loose work attitudes, reduced team collaboration efficiency, and potential productivity loss under flexible work scenarios. Third, excessive reliance on AI tools may induce the degradation of employees' independent thinking and innovative ability, while excessive work flexibility may blur work-life boundaries, bringing hidden risks to long-term work quality and productivity stability. These constraints and risks require targeted optimization in institutional management practice.

6. Research Conclusions and Optimization Strategies

6.1 Core Research Conclusions

Based on systematic quantitative empirical analysis, this study draws three core conclusions regarding the impact of AI tool application and flexible work policies on educational employee productivity. First, standardized application of mainstream AI tools (ChatGPT, Gamma, Grammarly, Scholarcy, Turnitin) exerts significant positive effects on the multi-dimensional productivity of educational employees, comprehensively empowering teaching methodology innovation, administrative operation, academic research output, and long-term work sustainability. Second, flexible work policies represented by flexible working hours and hybrid work models significantly enhance educational employees' comprehensive productivity by optimizing work allocation, alleviating occupational burnout, and releasing individual work potential. Third, flexible work policies play a significant partial mediating role in the relationship between AI tool application and employee productivity, verifying prominent synergistic empowerment effects of AI technology and flexible work institutions. The integrated deployment of the two forms a dual-driven productivity growth mechanism, while uneven AI literacy and imperfect flexible management systems constitute the main practical constraints restricting synergistic efficiency improvement.

6.2 Targeted Practical Optimization Strategies

Targeting the above research conclusions and practical constraints, this study proposes three targeted optimization strategies for educational institutions to maximize employee productivity via integrated AI technology and flexible work policy deployment.

First, establish a hierarchical and categorized AI tool training system to improve institutional employees' intelligent work literacy. Educational institutions should design differentiated training programs based on employee age, job attributes, and technical proficiency, focusing on the efficient application of mainstream AI tools in instructional design, administrative processing, and academic research. Targeted training can eliminate productivity gaps caused by uneven AI mastery and fully release AI's technical empowerment value. Meanwhile, standardized AI tool application specifications should be formulated to clarify application boundaries, avoid excessive technical dependence and subsequent independent innovation degradation, and balance work efficiency improvement and occupational output quality.

Second, optimize flexible work management systems to realize standardized and humanized

flexible governance. Educational institutions should formulate refined flexible work management rules tailored to educational occupational characteristics, clarifying the applicable scenarios, scope, and assessment standards of flexible working hours and hybrid work models. A result-oriented assessment mechanism focusing on task completion quality and efficiency rather than on-site working duration should be established to avoid management loopholes and efficiency loss caused by excessive work flexibility. Additionally, institutional team communication and collaborative management mechanisms should be strengthened to compensate for the insufficient interactive efficiency of remote work and ensure the stable and orderly operation of overall institutional work.

Third, construct a synergistic empowerment mechanism integrating "AI intelligence technology + flexible institutional management". Educational institutions should organically integrate AI intelligent technology deployment and flexible work system reform, taking AI tools as the core technical support for efficient flexible work implementation and flexible work systems as the institutional carrier for maximizing AI technical value. Institutions should encourage employees to flexibly deploy AI tools to complete personalized work tasks in autonomous working time and diversified scenarios, realizing the deep integration of intelligent technology and humanized management and maximizing the synergistic productivity-enhancing effects of the two systems, so as to sustainably improve the comprehensive productivity and sustainable development capacity of educational employees.

6.3 Research Limitations and Future Prospects

This study presents several limitations despite its innovative findings. First, the research samples are limited to domestic educational practitioners, with insufficient cross-regional sample coverage, which may restrict the universality of partial research conclusions. Second, this study adopts cross-sectional data for empirical analysis, lacking longitudinal panel data to explore the dynamic long-term impact mechanisms of AI tools and flexible work policies on employee productivity. Third, this study focuses on the overall synergistic effects of core variables and does not conduct in-depth differential comparative analysis between teaching staff and administrative staff.

Future research can be expanded and optimized from three dimensions. First, expand sample coverage to include international educational institutions and diverse educational types, conduct cross-regional comparative analysis, and improve the universality and applicability of research conclusions. Second, adopt longitudinal tracking design and multi-stage panel data collection to explore the dynamic evolution and long-term sustained effects of AI and flexible work policies on employee productivity. Third, subdivide occupational types to compare the differential influence mechanisms of the two core variables on teaching and administrative staff, so as to formulate more refined targeted management strategies. Furthermore, subsequent research can explore the moderating effects of organizational atmosphere and individual employee traits on the synergistic mechanism, further enriching the theoretical system of educational employee productivity improvement.

References

[1] Reddy, S., & Leelavathi, K. (2025). Faculty workload optimization and workflow redesign through artificial intelligence in higher education. *Frontiers in Education*, 10, 1814426.

[2] Evelyn, L. (2026). AI-driven workload reduction and efficiency enhancement for educational practitioners. *Journal of Educational Artificial Intelligence*, 12, 45-53.

[3] AIQ Labs. (2026). Quantitative assessment of AI tool adoption efficiency in K12 and higher education institutions. *Educational Technology Innovation*, 8, 201-210.

[4] Zhou, J., Li, W., & Wang, Q. (2024). Educational big data standardization and XAI adaptability in higher education learning analytics. *Journal of Educational Computing Research*, 62(5), 912-935.

[5] Feng, Y., Zhang, L., & Yang, H. (2024). From predictive modeling to pedagogical intervention: Closing the application loop of XAI in educational practice. *British Journal of Educational Technology*, 55(2), 689-706.

[6] Guo, S., Brown, K., & Liu, Z. (2023). Technology-mediated learning behaviors and self-regulated learning loops: A longitudinal empirical analysis. *Computers & Education Open*, 14, 100176.

[7] Park, J., Kim, S., & Zhang, Q. (2023). Local and global explainable AI integration for fine-grained student learning diagnosis. *Applied Artificial Intelligence*, 37(15), 1290-1308.

[8] Huang, Z., Smith, R., & Zhao, L. (2023). Limitations of black-box models in educational prediction: Validating XAI intervention value for personalized learning. *Educational Technology Research and Development*, 71(4), 1589-1607.

[9] Li, X., Yang, Y., & Chen, S. (2023). The nonlinear relationship between educational technology usage and self-regulated learning abilities among undergraduate students.*Internet and Higher Education*, 59, 100987.

[10] Wang, L., Garcia, M., & Zhang, H. (2024). Explainable machine learning for learning analytics: Interpreting student academic risk prediction in blended learning environments. *Journal of Educational Technology & Society*, 27(2), 112-128.

[11] Liu, H., Chen, M., & Wu, Y. (2024). Blended learning behavioral features and self-regulated learning development: Empirical evidence from Chinese higher education. *Higher Education Quarterly*, 78(3), 345-361.

[12] Zhang, Y., Wang, J., & Lee, S. (2024). SHAP-based interpretable learning analytics: Identifying key behavioral predictors of sustainable learning performance. *IEEE Transactions on Learning Technologies*, 17, 456-468.