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Construction of a research model for student work in engineering colleges in the digital age

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ABSTRACT

In the digital age, the deep integration of information technology into higher education has transformed student work in engineering colleges. Traditional experience-based management fails to meet dynamic student needs, necessitating a shift to data-driven approaches through systematic modeling. This study identifies core dimensions via literature review, establishes a factor interaction system, and constructs a student work effectiveness analysis model using multiple linear regression. It converts the abstract system into a quantifiable framework with variables like policy support, management mechanisms, and professional competence. Using structural equation modeling and regression analysis, the study verifies each variable's positive impact on work effectiveness. Quantitative research reveals how social factors, organizational resources, professional capabilities, student characteristics, and informatization levels drive work effectiveness, offering a scientific basis for resource allocation. The digital environment requires overcoming fragmented management, while engineering students' strong professionalism and practical needs demand personalized, targeted work. The proposed model provides an operable evaluation system, guiding the optimization of university-college management. It enables precise decision-making by identifying key factors, constructs dynamic monitoring via longitudinal data, and clarifies variable causal relationships through path analysis. Ultimately, model-driven precision services support cultivating high-quality, innovative engineering talents adaptable to the digital era.

Contribution/ Originality: This study constructs a linear regression model and innovatively carries out an overall evaluation of the implementation of student affairs in higher education institutions, taking into account five major influencing factors: Social factor, organizational resources, vocational ability, student situation, and educational informatization.

1. INTRODUCTION

1.1. Foreign Research Status

Currently, discussions on the evaluation model for student affairs in higher education institutions have taken on the characteristics of diversification and interdisciplinarity in the international academic community. Scholarly efforts focus on in-depth explorations across the dimensions of the Teaching Excellence Framework, learning outcomes evaluation systems, and the construction of an ecological system for student development, yielding theoretical achievements with practical guiding significance. At present, data-driven dynamic evaluation mechanisms and holistic education models have become the core focus of overseas research, particularly in fields such as teaching quality

assessment, the tracking of students' competency development, and the development of inter-university collaboration mechanisms.

Current international academic research on student work model construction is characterized by technology-driven approaches and diverse perspectives. Teke and Tarhan (2024) designed a systematic solution for the specific needs of Dokuz Eylül University in Turkey by integrating an intelligent FAQ system and electronic work order processes, aiming to improve student service efficiency through technical means and outlining an intelligent upgrading path with integrated AI modules (Aiken-Wisniewski, Komives, Taub, & Whitney, 2023). Regarding project development capabilities, Aiken-Wisniewski et al. (2023) pointed out the lack of project planning competence in the NASPA/ACPA professional competency framework and proposed the Integrated Model for Program Development (IMPD). This model systematizes project planning into four phases: needs identification, definition and planning, implementation and initiation, and evaluation, supplemented by phase-specific task lists and practical tools such as Excel templates, filling the competency gap in student affairs education (Teke & Tarhan, 2024). The Open University (OU) in the UK independently developed the Early Alert Indicators (EAI) Dashboard, which applies predictive learning analytics through machine learning technology. Research has shown that this system exerts a positive impact on indicators such as retention rates, pass rates, and academic performance.

1.2. Domestic Research Status

Currently, discussions on the evaluation model for student affairs in higher education institutions have presented diverse perspectives within the domestic academic community, with extensive research conducted around dimensions such as satisfaction with ideological and political education, evaluation of student financial aid, student competency cultivation, and college counselors' competency. A wealth of important theoretical achievements has been made in this field. At present, the construction and application of evaluation models for university student affairs have become a research focus both domestically and internationally, especially in the areas of counselors' ideological and political education, student financial aid management, and student competency development.

In the field of counselors' ideological and political education, Du (2020) adopted the Customer Satisfaction Index (CSI) model to conduct research on counselors' work, analyzing influencing factors from four dimensions, including the pertinence of educational methods and the timeliness of communication. This research has advanced the quantitative evaluation in the field of ideological and political education in universities and pioneered a new direction for the construction of satisfaction models. Jia (2016) established a student affairs satisfaction index system via the Structural Equation Model (SEM), which covers 12 indicators such as student development management, teacher teaching, and campus environment. He innovatively adopted the quadrant analysis method to distinguish key indicators from non-key ones, providing empirical evidence for the improvement of student affairs. Based on the deeds of the "Most Outstanding University Counselors," Fang and Yun (2025) constructed a model of new-quality competency in ideological and political work by applying Grounded Theory, and proposed five core categories, including professional core literacy and political guidance capability, thus providing a theoretical framework for the professional development of counselors. In 2022, Wang and Xiao (2022) built a job competency model for counselors comprising five dimensions, such as individual characteristics and role image, through mixed research methods. Empirical surveys revealed that students' evaluations of counselors' competency exhibit group differences in terms of gender and grade, suggesting that counselors need to base their work on the differentiated needs of students.

In the field of student financial aid management, Zhao (2015) integrated the Balanced Scorecard (BSC) with the Analytic Hierarchy Process (AHP) to construct an evaluation model for financial aid to impoverished students, which includes 16 indicators across four dimensions (financial, customer, internal process, and learning and growth). He quantified performance through fuzzy evaluation, and empirical results showed that this model can significantly improve the efficiency of fund utilization. Taking college counselors in Shanghai as the research object, Ge (2016)

constructed a four-tier competency model featuring 9 qualities, such as a sense of responsibility and proactiveness, laying a foundation for the design of targeted training systems.

In the field of student competency cultivation, Li (2013) developed the "Three-Dimension and Nine-Item" competency model (basic competency, professional competency, and developmental competency) in light of the characteristics of colleges and universities jointly built by central and local governments, and realized the observability of competencies through 36 behavioral indicators. Practice in a university demonstrated that this model can systematically raise the compliance rate of students' comprehensive competency. Against the backdrop of big data, Li and Shao (2022) constructed the theoretical model of the "Task-Data-Method" three-dimensional intelligent student affairs model. Through measures such as core goal confirmation and data platform construction, they achieved the holistic integration of elements and personalized services in the student affairs model.

In the field of the integration of Party building and talent cultivation, Huang (2025) analyzed the long-term mechanism of university student Party building in guiding youth volunteer services based on the CSAA Knowledge Management Model, and put forward five suggestions, including strengthening theoretical education and integrating university resources. Long (2023) constructed the TAVE cycle model (Ideological Cognition, Behavioral Transformation, Value Shaping, Role Model Influence), which promotes the in-depth integration of Party building with moral education and talent cultivation, and addresses such problems as the lack of regular application and the absence of long-term mechanisms in the integration process. Xie (2022) built a competency onion model for university student affairs administrators containing 35 competency elements by using the text analysis method and Analytic Hierarchy Process (AHP), providing instrumental achievements for all links of talent management, including recruitment, employment, training, and retention.

1.3. Literature Commentary

In overseas research on university student affairs, the mainstream perspectives typically focus on the adapted application of the Customer Satisfaction Index (CSI). In China, by contrast, researchers mostly adopt localized research methods that integrate the Balanced Scorecard (BSC), Analytic Hierarchy Process (AHP), Grounded Theory, and other methodologies. After reviewing domestic and foreign research on student work, it is found that existing studies on the overall effectiveness evaluation of student work are insufficient, with the following main limitations: First, the research mostly focuses on the evaluation of a single indicator for university student affairs, such as constructing models targeting the cultivation of students' employability, research on counselors' competency, Party building, and the evaluation of students' psychological status, among other areas. Second, research methods predominantly rely on questionnaire surveys and case studies, with insufficient application of big data techniques for sample data analysis in the digital age context.

These research gaps provide the research space for this paper. Based on multiple linear regression, this study constructs a student work effectiveness analysis model, converts the abstract work system into a quantifiable indicator framework, and uses structural equation modeling and regression analysis for hypothesis testing. Quantitative research reveals the operational mechanisms of five dimensions, social factors, organizational resources, professional capabilities, student characteristics, and informatization level, on student work effectiveness, supporting the scientific and systematic development of student work in engineering colleges.

2. DISCUSSION

Domestic and foreign research on student work models exhibits distinct complementary characteristics. International research emphasizes technology-driven approaches, while domestic models focus on integrating ideological and political education with local practices. Specifically, the research presents the following features: First, international studies prioritize technology-driven solutions, such as the EAI early warning system of the Open University in the UK, and tend to focus on the technical application and research of daily student management.

Second, domestic models emphasize the integration of ideological and political education with local practices, but there is a lack of comprehensive evaluation models for student work implementation. Third, technology integration has become a common trend, with the increasing application of AI and big data. Fourth, model integration research is still in its preliminary stage, and the synergy effect needs to be strengthened.

Future research should focus on the theoretical construction and empirical verification of integrated evaluation models for overall student work, while emphasizing ethical norms and risk prevention in technology integration, the development of personalized educational support systems, and the improvement of international comparative research frameworks. Systematically integrating the advantages of various models to construct a student development support system that adapts to the needs of the new era is an important path to improve educational quality.

3. METHODOLOGY

3.1. Research Approach

This study adopts a progressive research framework combining theoretical construction and empirical verification, emphasizing a systematic research path from abstraction to concreteness and from theory to practice. First, through systematic literature review and theoretical analysis, the core dimensions and internal structure of the student work model are established, laying a conceptual foundation for subsequent research. Second, through comparative studies of typical domestic and foreign cases and policy text analysis, key factors influencing the student work system and their operational mechanisms are identified, constructing a multi-level influencing factor system. Finally, relying on large-sample questionnaire surveys and longitudinal data collection, statistical methods such as structural equation modeling and multiple regression analysis are used to construct a quantifiable and operable student work effectiveness model, and empirical tests are conducted on the proposed theoretical hypotheses.

This study follows a complete logical chain from theoretical deduction to practical application: at the theoretical level, hypotheses on the dynamic interactions among factors are established by analyzing the constituent elements and logical relationships of the student work system; at the methodological level, it emphasizes the combination of quantitative and qualitative research, cross-validating findings through multiple methods such as questionnaires, interviews, and text analysis; at the empirical level, statistical techniques such as regression analysis and path analysis are used to verify the impact mechanisms of each variable on work effectiveness, and test the model fit and predictive validity. Thus, research conclusions with both theoretical depth and practical guiding value are formed, providing a basis and reference for promoting the scientific and professional development of the student work system.

3.2. Research Methods

3.2.1. Literature Review Method

The literature review method refers to a research approach that systematically collects, sorts out, and discriminates literature, and on this basis, conducts in-depth analysis of literature content to form a scientific understanding of the research object. This method emphasizes critical reading and comprehensive application of existing literature, with high theoretical value and practical guiding significance. In this study, to fully grasp the research progress in student work model construction at home and abroad, a wide range of literature was collected, including academic monographs, doctoral and master's theses, core journal articles, international conference papers, and professional online database resources. Special attention was paid to research results in the past five years to reflect the latest developments in the field. Through content analysis, comparative induction, and thematic summary of the collected literature, the theoretical propositions, practical cases, and methodological contributions of domestic and foreign scholars in student work model construction were systematically sorted out, providing a multi-dimensional and multi-level theoretical basis and empirical support for the model construction of this study.

3.2.2. Statistical Analysis Method

A student work effectiveness analysis model was constructed based on the principle of multiple linear regression. This model explores the linear relationship between multiple independent variables (social factors, organizational resources, professional capabilities of student affairs staff, student characteristics, educational informatization level, etc.) and the dependent variable (student work implementation) through statistical methods, thereby quantitatively evaluating the effect of educational interventions. The research strictly adheres to the principles of directionality, integrity, and independence: directionality ensures that the model always centers on the goal of talent cultivation; integrity requires that the variable system fully covers all dimensions of student work; independence avoids multicollinearity among variables, ensuring the accuracy and reliability of the analysis results. Through this mathematical model, the complex student work system is converted into a structured and quantifiable analysis framework, defining key indicators, designing data collection processes, and conducting regression analysis, providing scientific methodological support for empirical research, enhancing the objectivity and reproducibility of the research, and ultimately contributing to the optimization of educational decision-making.

4. MAIN TEXT

4.1. Theoretical Basis for Model Construction

Statistics is a discipline focusing on data collection, analysis, interpretation, and presentation, widely applied in various scientific fields. Generally, statistical analysis can be divided into two categories: descriptive analysis and inferential statistics.

In the field of statistics, regression analysis refers to a statistical method used to determine the quantitative relationship of interdependence between two or more variables. According to different classification criteria, regression analysis can be divided into multiple types: based on the number of variables involved, it can be divided into simple regression analysis and multiple regression analysis; based on the number of dependent variables, it can be divided into single regression analysis and multivariate regression analysis; based on the nature of the relationship between independent and dependent variables, it can be divided into linear regression analysis and nonlinear regression analysis. The core purpose of regression analysis is to infer the corresponding values of the dependent variable with the help of known independent variable values.

When regression analysis is applied in prediction scenarios, it is first necessary to clarify the prediction object and set the dependent variable y. In this study, the implementation effectiveness of student work in engineering colleges is selected as the dependent variable, and then a series of variables related to this dependent variable are screened and identified as independent variables. In practice, there are many independent variables related to the implementation effectiveness of student work in engineering colleges, mainly including social environmental factors, organizational management models, staff quality, student characteristics, informatization construction level, and other aspects.

4.2. Factors Influencing the Implementation of Student Work in Engineering Colleges

4.2.1. Social Factors

The implementation of student work in engineering colleges is closely related to social environments such as politics and the economy. In the process of student cultivation, the social environment continuously invests human, material, and financial resources, while universities feed back into society by transporting talents, scientific and technological achievements, and technical services. Therefore, changes in social environmental factors such as policies, the economy, and media publicity will significantly drive the adjustment of student work in engineering colleges.

4.2.2. Organizational Resources

Organizational resources refer to various resources required to ensure the normal operation and sustainable development of an organization. In the field of student work, they specifically refer to various supporting elements that support the efficient operation and goal achievement of the student work system. They are mainly reflected in the soundness of the two-level (university and college) student work management mechanism, the support intensity of tangible and intangible resources (such as special policy support in intangible resources, and the construction of special venues for student work in tangible resources), and the construction of various work systems and platforms.

4.2.3. Professional Capabilities of Student Affairs Staff

Professional capabilities refer to the skills and abilities necessary for people to engage in specific occupations, which are a collection of various abilities possessed by practitioners in professional positions and demonstrated in professional behaviors. Taking counselors as the main body of student work, from the perspective of performing job responsibilities and completing work tasks, counselors' professional capabilities are an organic unity of explicit and implicit abilities. At the external performance level, their explicit abilities are specifically reflected in political direction guidance, moral quality standardization, ideological education guidance, organizational management coordination, life behavior guidance, and professional work innovation; while implicit abilities are prominently reflected in personality influence, self-learning and improvement ability, and psychological adjustment ability.

4.2.4. Student Characteristics

4.2.4.1. Personality Traits

The term "personality" originates from the Latin word "persona," which originally meant "mask." Although academic circles and authoritative documents have different expressions for the definition of personality, their core meanings are consistent: Cihai defines it as "a relatively stable personality psychological characteristic in people's attitudes and behaviors towards reality, which is the core part of personality, best reflects individual differences, and has a complex structure." The Modern Chinese Dictionary states that personality refers to "psychological characteristics displayed in attitudes and behaviors towards people and things, such as cheerfulness, fortitude, cowardice, rudeness, etc.".

4.2.4.2. Educational Background Differences

Educational background refers to the highest level of education certification obtained by laborers from the education system. It generally refers to an individual's educational experience, including graduation from educational institutions with backgrounds approved and filed by the national government and obtaining graduation certificates from those institutions. In China, educational backgrounds are usually divided into illiteracy, primary school, junior high school, senior high school, vocational high school, technical secondary school, junior college, undergraduate, master's, and doctoral degrees.

4.2.4.3. Family Background

Family background refers to the family resources owned by students, reflecting the characteristics of the social structure to a certain extent. As the structural factor most closely related to individual behavior, economic capital, cultural capital, and social capital in the family reflect the order attribute of the social structure externally and internally affect individual development by transmitting this structural attribute.

4.2.4.4. Subjective Initiative

Subjective initiative refers to the initiative and creativity displayed by humans in the process of understanding and transforming the world, and is an important manifestation of human subjectivity. This concept emphasizes the

conscious and independent choice ability of people in practice, enabling them to actively understand the world and transform it according to their own will. In terms of student characteristics, subjective initiative is reflected in students' enthusiasm and attention to various student activities.

4.2.5. Educational Informatization Level

Educational informatization refers to the comprehensive application of information technology in the education system by the state or educational departments according to actual needs, promoting the development of educational informatization through comprehensive planning and construction, and ultimately realizing educational modernization. As a dynamic development process, the definition of educational informatization is constantly improving with the passage of time and concept renewal.

Higher education informatization can be regarded as the expansion and extension of educational informatization. Its core is to cultivate high-quality talents adapting to social needs by using various information technologies under the guidance of modern educational concepts, and at the same time promote the digitalization, networking, and automation of teaching, scientific research, management, and services in higher education institutions.

4.3. Construction of Data Analysis Model

Student work is a complex social system, including subjects such as the government, universities, industry enterprises, and students. It is externally influenced by policy factors and economic factors, and internally covers various elements such as hardware facilities, organization and management, personnel quality, student characteristics, and informatization level, with certain uniqueness.

4.3.1. Analysis of the Impact of Factors on Student Work Effectiveness

4.3.1.1. The Impact of Social Factors on Student Work

Social factors include national policies, social media reports and publicity, and social and economic development status, which have a decisive impact on the effectiveness of student work. Specifically, national policies directly affect the allocation of educational resources and the formulation of student employment policies, providing policy support and guidance for students' career development and entrepreneurship. Social media reports not only shape the public's perception of education but also affect students' career choices and employment prospects. Positive reports can inspire students to make progress, while negative reports may have a negative impact. The social and economic development status determines the demand and opportunities in the job market. Economic prosperity usually provides more employment opportunities, while economic downturns may increase the difficulty of students' employment. Therefore, comprehensively considering social factors is crucial for improving the effectiveness of student work.

4.3.1.1.1. National Policies

The impact of national policies on student work cannot be ignored. A series of policies issued by the State Council, the Ministry of Education, and other departments, such as emphasizing the importance of moral education in higher education, have provided strong policy support for the implementation of student work (Wang & Shi, 2007). The introduction of these policies not only clarifies the direction and goals of student work but also provides necessary resources and guarantees for student work. High-level policy support enables student work to be carried out more smoothly and effectively promotes the all-round development of students.

4.3.1.1.2. Mass Media Reports and Publicity

The Ministry of Education clearly emphasizes the importance of "giving play to the role of new media platforms in promoting ideological and political work in colleges and universities," highlighting their extensive coverage and strong communication power to make them a vital part of student work (Fan & Zhang, 2005). Mass media reports

and publicity significantly influence the implementation of student work. Mainstream media establishes correct employment concepts and values for students by publicizing employment policies, guiding employment directions, and reporting employment models (He, 2015). Additionally, the guiding nature of social public opinion positively impacts student work. When social public opinion holds a positive attitude towards student work, its implementation becomes smoother and more likely to be recognized and supported by students.

4.3.1.1.3. Social and Economic Development Status

The social and economic development status is also one of the important factors affecting student work. With the improvement of the social and economic level, the funds invested by the state and universities in student work will increase accordingly. These funds can be used to improve the infrastructure of student work, enhance the quality and ability of counselors, and carry out a variety of campus cultural activities, thereby creating a better learning and living environment for students (Jiang & Xu, 2006). Therefore, the improvement of social and economic development is conducive to the implementation of student work and the improvement of students' comprehensive quality. In summary, social factors have a multifaceted and far-reaching impact on student work. Colleges and universities should fully understand and grasp these influencing factors, actively utilize favorable conditions such as national policies, social and economic development status, and mass media publicity, continuously innovate the methods and approaches of student work, and promote the all-round development of students. At the same time, colleges and universities should strengthen contact and cooperation with all sectors of society to jointly contribute to the implementation of student work.

H_1: Social factors have a significant positive impact on student work.

4.3.1.2. The Impact of Organizational Resources on Student Work

Organizational resources play a crucial role in student work, and their improvement directly affects the efficiency and quality of student work. The following discusses the impact of organizational resources on student work in depth from three aspects: institutional framework, resource support, and platform carriers.

4.3.1.2.1. Two-level (University and College) Management Mechanism

The two-level (university and college) management mechanism is the core institutional resource in organizational resources and an important guarantee for the smooth implementation of student work. The more sound the management mechanism, the clearer the division of labor among personnel, the higher the accuracy and coordination efficiency of resource scheduling, and the smoother the implementation of student work. This management mechanism not only helps to improve work efficiency but also provides an institutional framework for the precise investment of human, financial, service, and other resources, allowing limited resources to exert maximum effectiveness. It can even attract more external resources through institutional incentives, ensuring that various student work tasks are implemented in a timely and effective manner (Yao, 2003). By clarifying the responsibilities and powers of management departments at all levels, a working pattern of vertical linkage and collaborative cooperation is formed, thus providing a strong institutional guarantee for the smooth implementation of student work.

4.3.1.2.2. Two-level (University and College) Support Intensity

The attention paid by higher-level departments to student work and the intensity of resource allocation significantly impact the implementation of student initiatives. When higher-level departments prioritize student work and allocate substantial resources, student support and guarantees improve. These resources can be used to enhance student work conditions, improve counselor quality, and organize various campus cultural activities, such as establishing one-stop student service communities and secondary psychological counseling stations within

departments and colleges, thereby creating a better learning and living environment for students (Liu, 2018; Zhang, 2012). Therefore, the support intensity of higher-level departments essentially reflects their organizational resource supply capacity and is a key factor in the successful implementation of student work.

4.3.1.2.3. Construction of Work System Platforms

The construction of work system platforms is also of great significance for implementing student work. The more perfect the construction of various work system platforms, the stronger the resource integration capacity, the higher the service reach efficiency, and the more convenient and smooth the work implementation. These work systems include student information management systems, mental health education platforms, employment guidance service platforms, etc., which can provide students with comprehensive and multi-level services and support (Liu, 2003).

Through improving work system platforms, information-based and standardized management of student work can be realized, work efficiency and service quality can be improved, and thus, students' needs and expectations can be better met.

In summary, organizational resources have a multifaceted and far-reaching impact on student work. To improve the efficiency and quality of student work, colleges and universities should continuously improve the two-level (university and college) management mechanism, increase the support intensity of higher-level departments for student work, and strengthen the construction and improvement of work system platforms. Only in this way can a better learning and living environment be created for students, and their all-round development and growth be promoted.

H_2: The richer the organizational resources for student work, the smoother the implementation of student work.

4.3.1.3. The Impact of Professional Capabilities of Student Affairs Staff on Student Work

Professional capabilities, especially the theoretical level and practical ability of the student work team, have a decisive impact on the effectiveness of student work. The following elaborates on how the professional capabilities of student affairs staff affect student work from two aspects.

4.3.1.3.1. Theoretical Level of the Student Work Team

The theoretical level of the student work team is the cornerstone for carrying out their work. When team members have relevant professional backgrounds, such as ideological and political education, psychology, and education, they possess more professional knowledge reserves, enabling them to understand students' needs more deeply and grasp the work direction more accurately (Sun, 2013). Educational background differences are also an important factor affecting the theoretical level. Compared with master's degree holders, doctoral practitioners usually have a deeper professional background and a broader academic perspective, which helps them put forward more innovative and forward-looking ideas in their work. In addition, the number and duration of participation in relevant professional training are also key ways to improve the theoretical level. Through continuous learning and training, the student work team can continuously update their knowledge, master the latest theories and methods, and thus more effectively guide the practice of student work.

4.3.1.3.2. Practical Ability of the Student Work Team

Practical ability is an indispensable and important quality of the student work team. The longer the years of engaging in relevant work, the more practical experience team members accumulate. They are more able to skillfully handle various complex situations and accurately grasp the rhythm and intensity of work (Jiang, 2011). The number of practices is also an important way to improve practical ability. By dealing with emergencies and participating in various practical activities many times, team members can continuously accumulate experience, exercise their

adaptability and problem-solving ability. These practical experiences not only help them carry out their work better but also lay a solid foundation for their career development.

In summary, the theoretical level and practical ability of the student work team have a far-reaching impact on student work. To improve the quality and efficiency of student work, colleges and universities should focus on constructing and training the student work team, enhancing their theoretical level and practical ability, and thus provide students with better and more professional services.

H_3: The higher the professional capabilities of student affairs staff, the smoother the implementation of student work.

4.3.1.4. The Impact of Student Characteristics on the Implementation of Student Work

Student characteristics are the cornerstone of carrying out student work, which is directly related to the difficulty and effectiveness of student work. The following elaborates on how student characteristics have a far-reaching impact on the implementation of student work from four core aspects: personality traits, educational background differences, family factors, and students' subjective initiative.

4.3.1.4.1. Personality Traits

Students' personality traits significantly impact their work. Extroverted students with a strong desire for self-expression increase the factors that need consideration and pose more challenges. Such students may find it harder to accept traditional management methods and require more flexible, personalized strategies for guidance.

Therefore, the more extroverted the students' personalities and the more prominent their demand for self-expression, the more complex the implementation of student work may be, requiring more patience and wisdom.

4.3.1.4.2. Educational Background Differences

Educational background differences are another important factor affecting the implementation of student work. Generally, master's and doctoral students are usually more mature than undergraduate students in terms of academic level, self-management, and communication skills. This makes master's and doctoral students easier to communicate with and manage in student work, thus facilitating its smooth implementation. Therefore, educational background differences affect the difficulty of student work to a certain extent.

4.3.1.4.3. Family Factors

Family factors have a profound impact on student characteristics, which in turn affect student work. Some students with complex family backgrounds may be more prone to psychological adaptability problems, such as anxiety and depression. These problems not only affect students' academic performance but also bring challenges to student work. Therefore, when carrying out student work, it is necessary to fully consider students' family backgrounds and provide targeted psychological support and living assistance.

4.3.1.4.4. Students' Subjective Initiative

Students' subjective initiative is key to the smooth implementation of student work. When students have strong subjective initiative, they possess stronger self-management and self-driven abilities. Such students can actively participate in student work and establish good interactive relationships with teachers and classmates, thus facilitating the advancement of student work. Therefore, stimulating students' subjective initiative is an important way to improve the effectiveness of student work.

In summary, student characteristics have a decisive impact on the implementation of student work. To carry out student work better, it is necessary to fully understand students' personality traits, educational background differences, family factors, and subjective initiative, and formulate targeted strategies and measures to ensure the smooth and efficient implementation of student work.

H_3: The better the student characteristics, the smoother the implementation of student work.

4.3.1.5. The Impact of Educational Informatization Level on the Implementation of Student Work

In the context of the new era, the application of information technology, such as the construction of information platforms and the application of big data analysis, has had a far-reaching impact on the implementation of student work. With the development and application of student information management systems, the value and role of university student information management have become increasingly prominent. Through the use of advanced information technologies such as big data and cloud computing, information management accurately collects, efficiently manages, and in-depth analyzes relevant data of on-campus students and teachers, thereby significantly improving the utilization rate of campus resources (Chang, 2007). This management method not only provides more convenient and efficient services but also greatly promotes the intelligent upgrading and efficient operation of campus management, reducing process obstacles and communication costs for student work.

In the context of the new era, student information management has become an inevitable trend in the current field of school management (He, 2006). As a product of the development of the new era, the smart campus not only makes up for the deficiencies of the traditional digital campus in data processing and information sharing but also brings unprecedented convenience to teachers and students in teaching and campus management. Through the construction of information platforms and the application of big data analysis, schools can more comprehensively understand students' learning and living conditions, provide students with more personalized and precise services, and thus promote the smooth implementation of student work.

H_5: The higher the level of educational informatization in colleges and universities, the more convenient the implementation of student work.

4.3.2. Construction of Student Work Effectiveness Model

4.3.2.1. Principles for Data Model Construction

4.3.2.1.1. Directionality Principle

The ultimate goal of student work is talent cultivation, and its effectiveness is the concretization of the talent cultivation goal. Therefore, when constructing the data analysis model, it is impossible to deviate from the talent cultivation goal of higher education institutions. This goal plays an orienting and guiding role in educational activities, clarifying the direction of efforts for student work.

4.3.2.1.2. Integrity Principle

When constructing the data model, independent variables should be selected based on the integrity of the dependent variable, and the level and position of each independent variable should be appropriately determined. It is not allowed to overemphasize the importance of a specific independent variable, resulting in the mistake of replacing the general with the individual and overgeneralizing. The integrity principle requires that after the initial determination of the data model, many independent variables should be measured as a unified whole to see if the sum of these independent variables can fully explain the dependent variable.

4.3.2.1.3. Independence Principle

The principle of independence at the same level requires that there be no causal relationship between independent variables at the same level, and one independent variable cannot be derived from another. Each independent variable represents an independent aspect, and they do not overlap with each other, nor do they have an inclusive or intersecting relationship.

4.3.2.2. Construction of Regression Model

Based on the above research hypotheses, the model is established as shown in the following figure (Figure 1).

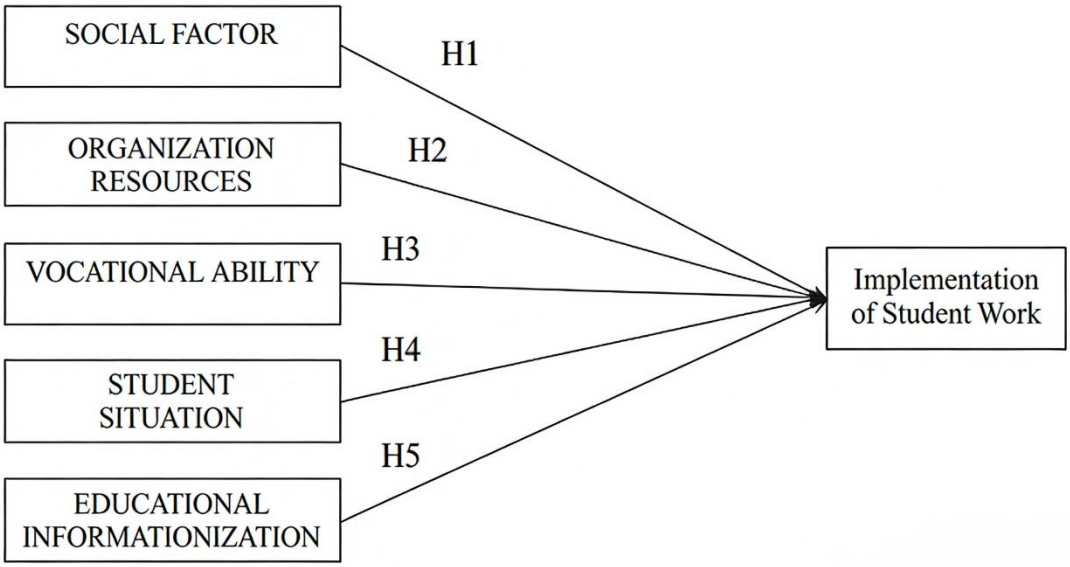

Figure 1. Research model.

Through research hypotheses, this paper constructs a multiple linear regression model as follows:

$y=\beta_0+\beta_1$SOCIAL FACTOR (EDUCATION POLICY, MEDIA PUBLICITY, SOCIAL ECONOMY)

$+\beta_2$ORGANIZATION RESOURCES (MANAGEMENT MECHANISM, SUPPORT, PLATFORM CONSTRUCTION)

$+\beta_3$VOCATIONAL ABILITY (THEORETICAL LEVEL, PRACTICAL ABILITY)

$+\beta_4$STUDENT SITUATION (CHARACTER, EDUCATION BACKGROUND, FAMILY BACKGROUND, SUBJECTIVE INITIATIVE)

$+\beta_5$EDUCATIONAL INFORMATIONIZATION $+\varepsilon$

Where SOCIAL FACTOR represents social factors; EDUCATION POLICY, MEDIA PUBLICITY, and SOCIAL ECONOMY respectively represent educational policies, social media reports and publicity, and social and economic development status; ORGANIZATION RESOURCES represents organizational resources; MANAGEMENT MECHANISM, SUPPORT, and PLATFORM CONSTRUCTION respectively represent the two-level (university and college) management mechanism, the two-level (university and college) support intensity, and the construction of work system platforms; VOCATIONAL ABILITY represents the professional capabilities of student affairs staff; THEORETICAL LEVEL and PRACTICAL ABILITY respectively represent the theoretical level and practical ability of the student work team; STUDENT SITUATION represents student characteristics; CHARACTER, EDUCATION BACKGROUND, FAMILY BACKGROUND, and SUBJECTIVE INITIATIVE respectively represent personality traits, educational background differences, family background, and students' subjective initiative; EDUCATIONAL INFORMATIONIZATION represents the educational informatization level and the implementation of student work; ε represents the random error term, indicating unobservable factors or random errors. In statistics, we usually assume that this random variable follows a zero-mean and homoscedastic distribution.

After establishing the multiple linear regression mathematical model, it is generally necessary to observe the goodness of fit and significance of the model, so statistical tests are required. Common statistical tests include the R test and the F test.

4.3.2.2.1. R Test

R is the multiple correlation coefficient, used to measure the goodness of fit of the regression model. The larger R is, the more significant the linear relationship between y and x is, where $\bar{y}$ is the average value of y, and the value range of R is $[0,1]$.

4.3.2.2.2. F Test

Where m is the number of independent variables, and n is the number of data points. F follows an F-distribution. Taking the significance level as α, if $F > F\alpha(m, n - m - 1)$, it indicates that the model has high significance and can be used for prediction. On the contrary, the regression model cannot be used for prediction.

4.3.2.2.3. T Test

The T test is used for the significance test of each variable, and its test statistic is:

Where $\hat{\sigma}$ is the regression standard error.

5. RESULTS

Student work is a key component of the talent cultivation system in institutions of higher learning. Conducting research on the talent cultivation effectiveness of student work in engineering colleges can not only fully reflect the value orientation of student work in Chinese universities but also respond to the practical concerns of the country in the field of talent development. This study focuses on the talent cultivation effect of student work in engineering colleges, introduces mathematical models as analytical tools, and, through the combination of theoretical research and quantitative analysis, provides corresponding research perspectives and a scientific basis for exploring the scientific development path and sustainable promotion model of student work.

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