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Original Paper

Project Management-Driven Multimodal Collection and Personalized Education of College Learning Psychology

Li Zhang[1*], Dan Fu[#] & Qiang Zou[2]

[1*] First author and corresponding author: Li Zhang, Sichuan Technology and Business University, Chengdu, Sichuan, 611745, China

[2] Second author: Qiang Zou, The 29th Research Institute of China Electronics Technology Group Co., Chengdu, Sichuan, 611731, China

[#] Co-corresponding author: Dan Fu, Sichuan Technology and Business University, Chengdu, Sichuan, 611745, China

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Abstract

In view of the problems of fragmented collection of college learning psychology and homogenized educational interventions, this paper introduces project management theory and builds a multi-modal data collection and personalized education system driven by the whole process of "planning-execution-monitoring-closure". The system integrates the three-dimensional data collection mode of behavioral data, physiological signals and subjective feedback, and relies on the progress control, resource allocation and risk warning mechanism of project management to realize the accurate collection and effective analysis of learning psychological data, as well as the efficient implementation of personalized education programs. Based on the teaching practice of colleges, this paper elaborates on the system construction path and implementation strategy, providing theoretical support and practical reference for improving the quality of mental health education and talent cultivation in colleges.

Keywords

Project Management, College Learning Psychology, Multimodal Collection, Personalized Education, Mental Health

1. Introduction

With the transformation of higher education to connotation development, the mental health problems of college students are increasingly prominent. Anxiety, learning burnout, lack of self-efficacy and other

problems have emerged one after another, which seriously affect academic performance and cause considerable harm to mental health (Li Dawei, Liu Hong, & Wang Gang, 2022). At present, the implementation of psychology education in colleges faces many difficulties. On the one hand, most of the data collection methods are limited to subjective evaluation methods such as traditional questionnaires, which lack the comprehensive application and refined collection of objective indicators. In addition, all kinds of data are scattered in different teaching links, which leads to the prominent problem of "information isolated island", and it is difficult to build a fully interconnected data support system (Yang Rui, 2019). On the other hand, the problem of homogenization of the educational intervention model is prominent, and the accurate strategy cannot be implemented in combination with the individual psychological characteristics and actual situation of students. It is difficult to meet the needs of personalized psychological education to solve differentiated problems with a unified paradigm.

As a systematic management concept, the core feature of project management is goal-oriented. Through planning, whole-process supervision and efficient collaboration, it is committed to optimizing resource allocation and steadily promoting tasks. Applying this theoretical framework to the field of psychology education in colleges is an effective strategy to solve related problems such as information fragmentation and homogenization of educational resources (Liu Shuxiu & Wang Yonghe, 2025).

2. The Core Connotation of Project Management-Driven Multimodal Collection and Personalized Education of College Learning Psychology

Project management refers to the process of using professional knowledge, skills, tools and methods to plan, organize, coordinate and control the resources involved in project activities to achieve the expected goals of the project. It is characterized by systematic, goal-oriented, whole-process management and controllability, including five process groups of start-up, planning, execution, monitoring and closure. In the context of learning psychology education in colleges, project management can regard "learning psychology collection—analysis—intervention" as a special project. By clarifying the tasks, responsible persons and time nodes at each stage, process chaos and waste of resources can be avoided, so as to improve the standardization and efficiency of education. Multimodal collection refers to the use of multiple data sources and multiple data collection methods to obtain information from research objects from all aspects to form a multi-dimensional and three-dimensional data overview. The multimodal collection of college learning psychology is centred on the learning psychology of college students, integrating three modal dimensions: behavioral modality collects objective behavioral data such as classroom interaction, homework submission, independent learning time, etc.; physiological modality collects physiological signals such as heart rate, attention level and stress index; subjective modality collects students' subjective cognition and emotional experience through questionnaires, interviews and study logs. The data of these three modalities complement each other and improves the accuracy of learning psychological evaluation (Wang Huafang & Yao Xizhe,

2024).

Personalized education takes students' individual characteristics as the starting point, relies on accurate psychological data analysis, and builds a differentiated teaching intervention model, aiming to achieve the educational goal of "teaching students according to their aptitude". The fundamental feature of personalized education is to abandon the traditional "one-on-one" tutoring mode and use real-time monitoring of learners' psychological development trajectory to adjust the support method in time to help students overcome cognitive barriers, improve academic performance, and promote the comprehensive improvement of independent learning ability and emotional regulation ability. This concept not only fits the physiological and psychological development laws of students in higher education, but also meets the strategic needs of modern colleges to cultivate high-quality talents, and provides a theoretical basis for student development planning from the perspective of project management (Chen Ting, 2020; Yang Jine & Li Ning, 2019).

3. Theoretical Foundations of Project Management-Driven Multimodal Collection and Personalized Education of College Learning Psychology

3.1 The Adaptive Support of Project Management Theory

The multimodal data collection and personalized education project of college learning psychology has the following characteristics. First of all, it has a clear goal and aims to improve the psychological state of students through data collection and interventions. Secondly, it has strict periodic requirements and needs to complete tasks such as data collection, data processing, project implementation and effect evaluation according to the school year schedule. Third, its operation requires the participation of counsellors, subject teachers, psychological counsellors and technical support personnel (Sun Ran, Chang Ninghui, Wang Zhaoxu, et al., 2023). The five process groups of multimodal collection and personalized education project management in college learning psychology can be well integrated into the whole education and teaching process and provide standardized operation guidance. After the project is launched, the goals and scope of the project are determined; in the planning stage, sampling strategies and teaching plans are formulated; in the implementation stage, specific operations and implementation are carried out; in the monitoring stage, the implementation progress is supervised and adjusted in time; in the closure process, the results and experience are summarized to improve the system, so as to form a complete closed-loop process (Yao Yao, 2013).

3.2 Multimodal Data Fusion Theory

The theory of multimodal data fusion is an important cornerstone of the study of accurate psychological measurement. Its core is to integrate data from different heterogeneous information sources, deeply explore potential association patterns, and go beyond the limitations of the traditional single dimension. In the field of learning psychological evaluation, the three-dimensional "behaviour-physiology-cognition" framework conducts a comprehensive analysis from the three perspectives of individual behaviour performance, physical and mental response and intrinsic

motivation characteristics. This multi-dimensional analysis model can build a relatively complete psychological characteristic model, thus providing a scientific basis for personalized educational decision-making (Zhou Qin & Wang Qiushuang, 2026). In the process of project management, it is necessary to formulate unified data collection standards and standardized processing processes to avoid conflicts or duplication caused by multiple data channels, so as to optimize the quality and efficiency of the entire data analysis work.

3.3 Constructivist Learning Theory

Constructivist learning theory emphasizes that learning is a process in which the subject actively constructs knowledge, and its effectiveness is closely related to the interaction between the subject's cognitive ability, emotional experience and external environment. This provides important theoretical support for personalized education (Su Zhifang, 2023). Personalized education does not simply apply a certain technical method, but plans a suitable learning path based on students' psychological characteristics, and encourages students to spontaneously develop, so as to achieve progress. By integrating teaching resources and improving the collaboration mechanism, project management can provide practical support for the implementation of the constructivist learning model, so that the customized scheme can accurately fit the actual situation and level of specific students (Chen Yuanjia, 2023).

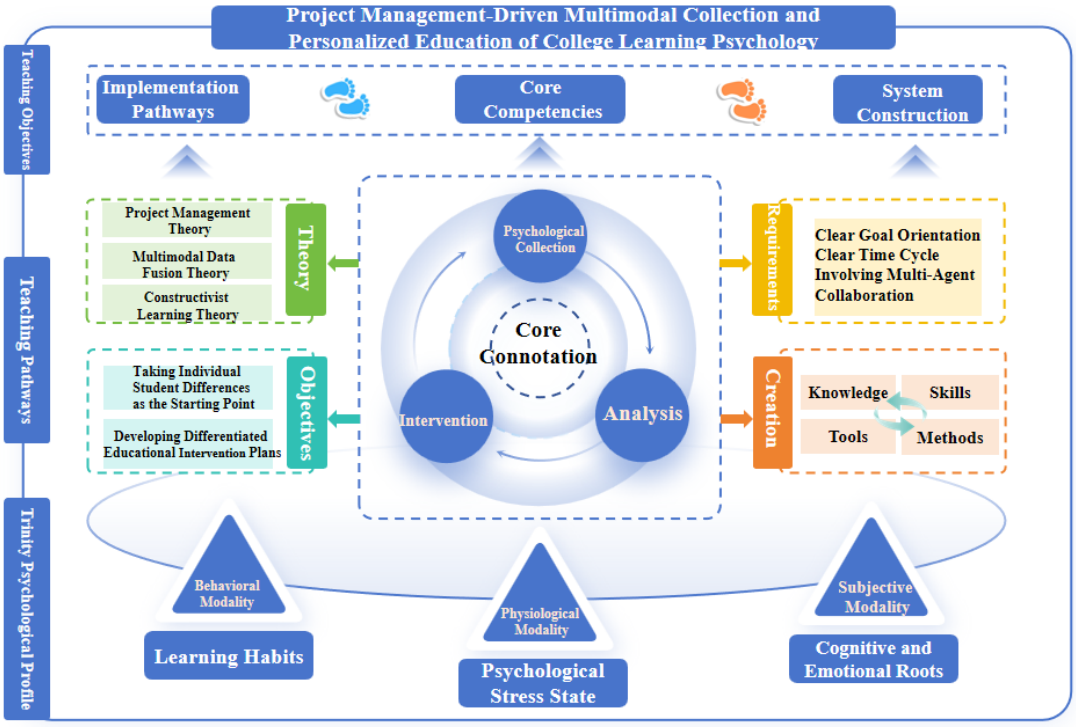

Figure 1. Research Framework Diagram

4. Construction of a Project Management-Driven System for Multimodal Collection and Personalized Education of College Learning Psychology

This research focuses on the five process groups of project management, builds an integrated framework of "goal guidance—process control—multimodal support—personalized operation", and divides it into five continuous and closely connected key links, aiming to realize the strategic vision of closed-loop management of the whole process.

Figure 2. Research Path Diagram

4.1 Project Start-up Stage: Defining Goals and Scope and Forming a Collaborative Team

The start-up stage is the key to the success of the project. Its main tasks include clarifying project boundaries and core goals, and forming a cross-departmental collaboration team. The following is project goal definition. Short-term goal: collect multimodal data on the learning psychology of students of specific grades/majors and establish accurate psychological portraits; medium-term goal: formulate and implement personalized educational intervention plans to solve students' major learning psychological difficulties; long-term goal: create a replicable and implementable project management framework to improve the learning psychology education methods in colleges. Project scope definition: clearly define the collection objects, collection cycle, modality elements and main contents of educational intervention to prevent the spread of project scope.

In terms of team building, in view of the important role of resource coordination in project management, a "1+4+N" collaboration mechanism is established. "1" represents the overall leader of the project, usually the counsellor or the director of the psychological center. "4" refers to the establishment of four specialized working groups: data collection group, data analysis group, education intervention group and technical support group. These groups assume different responsibilities, such as collecting data from multiple sources, providing quantitative research support, implementing personalized design schemes, and ensuring system operation and maintenance. "N" represents several

participating class liaison officers, usually members of the class committee or representatives of the psychological committee. Their main task is to assist in specific field research and provide relevant feedback. Through clear role division, optimizing the internal communication and coordination network, and standardizing the collaboration process, the organizational structure can operate efficiently and have clear goals.

4.2 Project Planning Stage: Designing Multimodal Collection Plans and Personalized Education Pathways

In the planning stage, it is necessary to formulate a detailed data collection plans, education paths and schedules in combination with the project objectives to avoid blindness in the implementation process.

(1) The design of the multimodal data collection plan should take into account the characteristics of the teaching environment of colleges, formulate specific collection methods and technical routes for various information, and form a standardized data processing process. Behavioral modality data is automatically collected through the campus smart education platform, including classroom attendance rate, teacher-student interaction frequency, courseware browsing time and homework completion quality and other indicators. Physiological modality data relies on ethical wearable devices (such as smart wristbands) to regularly monitor heart rate fluctuations, blood oxygen saturation and concentration during learning. It is recommended to sample 2-3 times a week, covering the main teaching period. Subjective modality data is collected through phased questionnaires, individual interviews and daily logs. The questionnaire survey focuses on students' academic pressure, self-efficacy assessment and related motivation development. Conducting in-depth interviews with students with abnormal feedback helps to fully understand individual differences. Students also voluntarily submit weekly study logs to track the changing trajectory of their emotional dynamics and influencing factors. At the same time, data security specifications have been formulated to clearly define the process of data storage, usage and destruction to protect students' privacy.

(2) Personalized education path planning scheme design. Based on the expected results of multimodal data analysis, three types of intervention measures have been formulated. For students with obvious anxiety symptoms, emotional regulation projects are implemented, including psychological counselling, meditation and stress management courses. For students who lack learning motivation, motivation strategies are adopted, such as goal setting, feedback and motivation, and task customization. For students with low self-efficacy, ability improvement training is strengthened, covering learning method guidance, staged achievement rewards and peer collaboration. A detailed schedule should be formulated to clearly indicate the important milestones of each stage. For example, complete the initial data collection in week 4, build a comprehensive portrait model in week 8, and carry out the first round of intervention activities in week 12.

(3) Risk control strategy planning. Corresponding preventive and control measures are formulated according to the potential risk factors that may be encountered in the project implementation stage. In order to cope with possible difficulties in the data collection stage, such as students' unwillingness to

participate or low response rate to questionnaires, a detailed publicity plan should be formulated in advance to explain the relevant operation steps and privacy protection measures. For potential technical risks, such as data loss caused by system crash, regular backups can be arranged, and technicians can be arranged to continuously monitor the operating status of the platform. In addition, a dynamic evaluation system should be established, and the intervention method should be continuously adjusted according to the feedback of the subjects, so as to further improve the intervention effect.

4.3 Project Implementation Stage: Advancing Data Collection, Analysis, and Educational Intervention Implementation

The implementation stage is the core of the project implementation. This stage requires strict implementation according to the plan, while strengthening multi-party collaboration and process control.

(1) Design and implementation steps of the multimodal data collection program: a special working group composed of technical support teams and class liaison officers is set up. The smart teaching platform automatically collects behaviour trajectories and regularly exports records. The data generated by wearable devices depends on the active upload of students, and the monitoring personnel are responsible for supervising the integrity of the data. Subjective feedback is distributed through the online questionnaire system; appointments are made and relevant information is recorded before the interview. The study log is sorted out by the liaison officers and then submitted to the data analysis department for processing. The whole process strictly abides by data security specifications. The original information is encrypted and stored, and only users with specific permissions can access it.

(2) Design and practice of multimodal data integration analysis framework. After the multimodal data collection is completed, the research team conducts research according to the systematic workflow of "preprocessing—integration—modeling—feature extraction". In the initial preprocessing stage, standardized methods are used to remove redundant or abnormal observations to ensure data quality. Subsequently, advanced algorithms are used to integrate information from different fields and deeply explore the potential relationship between various variables, such as the connection between physiological parameters and cognitive ability, or the impact of learning motivation intensity on learning duration. Then, based on the above research results, a psychological assessment model is constructed to form an individual psychological portrait to accurately identify the main needs and insufficient development of the target population, so as to provide a theoretical basis for the formulation of personalized teaching plans. Finally, the evaluation results are provided to the educational intervention module in a timely manner for application and promotion.

(3) The implementation steps of the personalized educational intervention plan mainly include the following links. First, establish accurate psychological profiles according to the individual psychological characteristics of students. Secondly, design a suitable counselling plan according to the set goals. Subsequently, organize a multi-party force, including counsellors, subject teachers and psychological counsellors to promote the implementation of the plan. Differentiated and hierarchical

management measures are adopted for different types of psychological problem groups. For students with mild needs, the focus is on online emotional counselling and learning method guidance. Students with moderate needs should receive personalized one-on-one tutoring services, supplemented by a task list to improve cognitive bias. For students with severe needs, it is necessary to form a team of experts inside and outside the school to jointly formulate a comprehensive plan and integrate it into the family support system according to the specific situation to enhance the synergy effect. Throughout the monitoring cycle, establish dynamic tracking files and regularly summarize the evaluation feedback information.

4.4 Project Monitoring Stage: Tracking Progress, Optimizing Plans, and Risk Warning

The monitoring system runs through the whole project implementation process. Through real-time monitoring and dynamic adjustment, it ensures the achievement of the set goals and enhances the adaptability of the program. The project manager regularly convenes plenary meetings of various functional teams to report on the stage results, compare the progress with the planned milestones, analyse the reasons for the delay, and propose improvement measures. For example, in response to the lagging data collection, the early warning mechanism should be improved and the frequency of collaboration should be increased. If the optimization effect is not ideal, it is necessary to adjust the specific content of the implementation plan in time according to student feedback and quantitative analysis results.

The technical operation and maintenance team continuously monitors the operation status of the data acquisition system and analysis platform, and deals with any potential technical problems in a timely manner. The data analysis team checks the integrity and accuracy of the collected data to ensure that the information quality meets the established standards. The educational intervention team relies on second-hand data collection and subjective feedback mechanisms to evaluate the effectiveness of interventions and make suggestions for improvement regarding ineffective programs. When encountering an expected risk or unexpected event, the emergency plan must be activated immediately. If students are unwilling to participate due to privacy concerns, they need to increase publicity and guidance, improve privacy protection measures, and adjust the data collection method according to the specific situation, so as to ensure the normal progress of the research.

4.5 Project Closure Stage: Effect Evaluation, Summary and Consolidation, and Experience Promotion

The key task in the final stage of the project is to systematically evaluate the project effect, improve the replicable experience model, and establish an effect evaluation system covering multi-dimensional indicators for comprehensive analysis from both quantitative and qualitative perspectives. In quantitative research, statistical methods are used to compare core variables such as students' performance, psychological assessment data and learning behaviour before and after the intervention. In qualitative research, through in-depth interviews with teachers and students, subjective feedback information is obtained, and the practical effect and social recognition of educational practice are comprehensively examined.

The project summary part should comprehensively review the experience results and existing problems in the implementation process, focusing on the technical path of multimodal data integration, cross-departmental collaborative improvement programs, and issues like insufficient resource allocation and slow information collection. On this basis, a systematic research report is written to transform the research results into operational guidelines. The toolkit, including multimodal data collection standards, personalized teaching intervention manuals and project management guidelines, are gradually promoted and continuously optimized at different academic stages and professional fields in the school, forming a cycle of "practice—evaluation—application—improvement".

5. Practical Application Case

In order to test the practical application and value of the system, this study selected first-year freshmen majoring in computer science of Grade 2024 from a certain university as an experimental sample. A special practical activity was designed and implemented for one semester (a total of 18 weeks). Statistics show that a total of 120 students participated in the project.

At the beginning of the project, an organizational structure based on the "1+4+N" model was established, and the core goal was to improve the adaptability of freshmen, while building a personalized psychological support system. In the planning stage, the focus is on designing a multi-dimensional data collection scheme. Behaviour trajectory was obtained through the campus smart education platform, wristband equipment that meets ethical norms was used to collect physiological indicators, and subjective feelings were dynamically monitored through monthly questionnaires, quarterly interviews and daily learning records. In order to cope with potential mental health risks, three intervention modules have been set up in advance—anxiety intervention, motivational stimulation and integration guidance, and a detailed step-by-step implementation plan was formulated to ensure the smooth progress of the overall work.

Implementation stage: Data collection and intervention measures were carried out in an orderly manner according to the preliminary plan. In the first four weeks, multimodal baseline information was comprehensively collected. The analysis team established a mental health records for the freshmen. The research showed that 82% of freshmen had different degrees of learning adaptation anxiety, and 65% of students lacked clear learning goals. Targeted plans were formulated for these two types of typical students. For students with obvious anxiety tendencies, three group decompression activities were organized, supplemented by individual psychological counselling. For students whose learning direction is vague, thematic seminars were organized to guide them to set specific and feasible goals, personalized practical tasks were assigned according to the characteristics of the subject and relevant course teachers were contacted to optimize the teaching progress and increase interactive links.

During the implementation of the project, a weekly progress monitoring mechanism was established to dynamically adjust and optimize the plan. In response to the delay in data collection of students' wristband, a daily reminder mechanism was added. For 15% of students who still showed anxiety

symptoms after the intervention, the psychological counselling process was improved, and a home-school connection module was added to further improve the existing measures. The final assessment results showed that the average learning anxiety index of freshmen participating in the project decreased by 32%, and the independent learning time increased by about 1.5 hours per day on average compared with the baseline level. The academic performance compliance rate increased by nearly 18 percentage points, and more than 80% of the respondents recognized the personalized consultation model. The standard operation manual formulated by the project was incorporated into the 2025 freshman mental health education system of the university and promoted as a regular teaching resource.

6. Conclusion

The concept of project management drives the construction of multimodal data extraction and personalized education system. Combining the advantages of process control and the characteristics of accurate information acquisition, the system solves the problem of fragmentation and homogenization of learning psychological education in traditional higher education. It builds a complete closed-loop management system around the five basic links of data extraction, information analysis, intervention implementation and effect evaluation. Relying on its function, it promotes the precise monitoring of individual students' learning statuses, thereby facilitating the successful achievement of goals in personalized academic cultivation planning. This provides a new pathway for optimizing talent cultivation standards and student mental health assurance in universities.

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