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Research on Time Allocation and Collaborative Mechanism of the Three-stage Training Model of "Theoretical Learning - Enterprise Practice - Innovation Transformation" in a Cross-border Campus

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ABSTRACT

The three-stage training model of "theoretical learning enterprise practice innovation transformation" emphasizes the progressive relationship between knowledge foundation, situational application, and value generation, attempting to bridge the "last mile" between university education and industrial employment. In practical implementation, the three-stage process often becomes a formality due to imbalanced time allocation, loose coordination among stakeholders, and lack of mechanism guarantees, making it difficult to form a collaborative force for education. Therefore, it is urgent to explore in depth the time allocation rules and multi-agent collaboration mechanisms of third-order cultivation. This article focuses on the cultivation path of primary education majors in the context of cross-border campuses, aiming to clarify the three-stage connotation characteristics based on educational theory, bridged by technology enterprise practice, and aimed at transforming educational innovation achievements. It constructs a time allocation model that is suitable for the development of normal students, and systematically designs a tripartite collaborative institutional path between universities, technology enterprises, and students, providing theoretical support for the integration and cultivation of high-quality primary school teachers and educational innovation talents under the background of new liberal arts.

KEYWORDS

Cross border campus; Theoretical learning; Enterprise practice; Innovation transformation; Time allocation; collaboration mechanism

1 Introduction

Currently, the deep integration of digital transformation in education and artificial intelligence technology has given rise to a large number of new forms of educational technology products and services, which pose new requirements for primary school teachers who possess both educational theoretical literacy and technological application abilities. The traditional teacher education model, which mainly focuses on teaching subject knowledge, is no longer able to meet the demand of basic education in the intelligent era for composite teachers who understand education, know technology, and can innovate. In this context, promoting collaborative education between teacher education and educational technology industry has become an important path to deepen teacher education reform. The country has successively issued policies such as the "Education Informatization 2.0 Action Plan", the "New Era Basic Education Strong Teacher Plan", and the "Guiding Opinions on Promoting the Pilot Work of" Artificial Intelligence+Education ", encouraging universities to cooperate with educational technology enterprises to jointly cultivate future teachers who can design, evaluate, and optimize educational products. The "three-level training model" of cross-border campus is precisely an institutional innovation that responds to this trend.

2 The Connotation and Characteristics of the "Three-level Training Model" in Cross-border Campuses

2.1 Theoretical Learning Stage

The main task of the theoretical learning stage is to build students' solid foundation in education, psychology, and primary school curriculum teaching ability, while integrating educational digital literacy. In the context of cross-border campuses, this stage should not only include major courses such as "Principles of Education", "Primary School Psychology", and "Primary School Chinese/Mathematics Curriculum and Teaching Theory", but also incorporate cross disciplinary modules such as "Application of Educational Technology", "Artificial Intelligence and Educational Innovation", and "Introduction to Educational Product Design". In terms of teaching methods, real cases from educational technology enterprises such as smart classroom systems and educational game design are introduced. For example, in majors such as primary education, students not only need to master classic courses such as education and educational psychology, but also need to be exposed to emerging fields such as artificial intelligence education. The teaching method should stimulate students' imagination of knowledge application scenarios by introducing real enterprise cases and setting problem oriented projects.

2.2 Enterprise Practice Stage

The enterprise practice stage is a three-stage training ability tempering field, aimed at enabling students to understand how technology serves teaching objectives in real educational technology scenarios. Students participate deeply in the design, testing, or optimization process of educational products as "educational product interns," "teaching content collaborators, " or "child user experience observers. The practical content may include assisting in the development of micro lesson resources for primary school subjects, participating in usability testing of educational apps for children, collecting feedback from frontline teachers on intelligent tools, and writing instructional application scenario explanation documents. In terms of scheduling, this stage usually focuses on the second semester of the third year or the first semester of the fourth year, lasting for 8-16 weeks. Universities and enterprises jointly formulate practical goals, emphasizing the balance between educational professionalism and technical feasibility. Through guidance from dual mentors, teaching reflection logs, product improvement suggestion reports, and other methods, the practice is ensured to comply with educational laws and meet industry needs.

2.3 Innovation Transformation Stage

The innovation transformation stage is the value sublimation stage of the three-stage cultivation, focusing on integrating educational theory, practical experience, and technological cognition to produce innovative achievements with educational significance. At this stage, students are encouraged to propose original solutions based on real-life problems in practice, such as "how to use gamification to enhance literacy interest in lower grades" and "how to design low-cost digital resource packages for rural primary schools". The achievements include primary school teaching design scheme integrating technology, digital education resource package for specific learning stages, prototype of simple education tools, innovative proposal of education services, or educational track projects participating in "Internet plus" and other events. In the cross-border campus ecosystem, university education laboratories, enterprise product incubation platforms, and local primary school pilot schools form a support network to provide students with full chain support from creativity to validation and implementation. This stage emphasizes the priority of educational value, focusing on the applicability of teaching results, child friendliness, and feasibility of promotion.

2.4 Overall Characteristics of Third Order Mode

The three-stage training model of "theoretical learning enterprise practice innovation transformation" presents distinct systematic, progressive, and collaborative characteristics. Systematicity is reflected in the three stages, which are not linearly separated, but form an organic whole, with each link nested and cyclically strengthened, forming a spiral upward path of "learning application creation feedback". Progressiveness is manifested as a hierarchical transition in the development of abilities: from internalization of knowledge to situational application, and then to value creation, in accordance with the cognitive laws of higher-order ability formation. And synergy is the lifeline of this model, aiming to break the limitations of universities as a single educational subject, and achieve multidimensional linkage among universities, enterprises, research institutions, and even governments through institutional design, resource sharing, and interest binding. In terms of time dimension, although there is a distinction between primary and secondary stages, flexible crossover is allowed; In terms of spatial dimension, the learning environment extends from traditional classrooms to product meeting rooms, user testing rooms, resource production workshops, and smart classrooms in collaborative primary schools of educational technology companies, creating a borderless learning field.

3 Research on the Time Allocation Mechanism of Third Stage Cultivation

3.1 Importance and Influencing Factors of Time Allocation

In the three-stage training model of "theoretical learning enterprise practice innovation transformation" in cross-border campuses, reasonable time allocation directly affects the depth of students' knowledge construction, the strength of their practical abilities, and the maturity of their innovative achievements. If the proportion of theoretical learning is too high, it is easy to fall into "empty talk on paper", which leads to students lacking the ability to solve real problems; If the practice of enterprises is hastily compressed, it will be difficult to form systematic engineering thinking; If innovation transformation is only used as an embellishment before graduation, it cannot stimulate the endogenous driving force of continuous creation. Therefore, time allocation is essentially a comprehensive balance between educational goals, industry demands, and student development laws. At the macro level, it is constrained by the national policy of integrating industry and education and the evaluation system of higher education; At the meso level, it depends on the positioning, disciplinary attributes, and depth of cooperation between universities and enterprises; At the micro level, it is

closely related to students' individual ability foundation, project complexity, and enterprise resource supply. Especially in the current context of emphasizing "new liberal arts" and "teacher literacy in the intelligent era", time allocation needs to break through the traditional semester system and rigid credit constraints, take into account national standards for teacher education and the needs of educational technology innovation practice, and transform towards flexibility, modularity, and outcome oriented.

3.2 Time Proportion Analysis between Three Orders

Based on research data from multiple domestic universities that have carried out deep integration of industry and education, there are significant differences in the current three-stage time allocation, but several typical patterns can be summarized. In the four-year undergraduate primary education major, the ideal proportion structure is: theoretical learning accounts for 55% -65% (including general education courses, educational theory courses, subject teaching methods, etc.), enterprise practice accounts for 20% -30% (which can be integrated with educational internships/ internships), and innovation transformation accounts for 10% -15% (mainly relying on graduation projects or comprehensive practical projects). For example, a certain university's primary education major adopts the "2.5+0.5+1" model: completing core courses and teacher basic skills training in the first two and a half years, entering an education technology enterprise for 8-12 weeks of project practice in the second semester of the third year, and returning to school in the first semester of the fourth year to complete an innovative graduation project that integrates educational technology based on practical problems (such as developing a set of primary school science AR teaching resource packages and conducting classroom trials). In contrast, some universities still maintain a "3.5+0.5" structure, which only arranges short-term internships in the last semester, resulting in superficial practice and hollow innovation. At the graduate level, more emphasis is placed on the weight of the latter two stages, such as the "0.5+1+0.5" or "1+1" model commonly used for professional master's degrees, which highly integrates enterprise practice and innovation transformation. It is worth noting that the time ratio should be dynamically adjusted with the pace of industrial technology iteration. In rapidly evolving fields such as artificial intelligence and integrated circuits, the theoretical teaching cycle needs to be shortened, and the speed of practical intervention needs to be accelerated to maintain the forefront of talent cultivation.

3.3 Time Allocation Strategies under Different Professional Backgrounds

Third order time allocation must vary depending on professional attributes. As a typical teacher education major, primary education should meet the dual goals of teacher professional standards and educational innovation literacy in its cultivation. Compared to pure educational technology majors that focus more on tool development, enterprise practice in primary education majors should focus on how technology can serve teaching, and the time should not be too long to avoid crowding out teaching method training; Innovation transformation emphasizes teaching application innovation rather than technological invention. In contrast, educational technology majors may be involved in corporate projects earlier and have a higher proportion of practical experience; And for majors such as teacher education, enterprise practice can focus on the teaching adaptation of subject based educational products.

3.4 Dynamic Time Management Mechanism

Faced with individual differences among students, rigid time allocation is no longer sustainable, and a flexible dynamic time management mechanism needs to be constructed. This mechanism is based on the standard of "ability achievement" rather than "completion of class hours", and triggers stage transition through process evaluation. Specifically, several key milestones can be established, such as completing the core curriculum group, passing the enterprise project defense, developing educational product prototypes and passing the teaching trial evaluation, or winning awards in provincial-level or above teacher education innovation competitions. Under this framework, students can accelerate or delay a certain stage of progress according to their own progress, achieving personalized growth paths. For example, students with strong engineering foundations can enter enterprise practice in advance, while those with weak theoretical knowledge can strengthen their skills through supplementary modules before transitioning. At the same time, it is allowed to convert non course activities such as high-quality competition awards, technological achievement transformation, and entrepreneurial practice into equivalent time for the corresponding stage. To support this mechanism, it is necessary to develop a digital management platform that can record learning trajectories, project progress, and capability maps in real-time, and have a team of school enterprise mentors conduct dynamic analysis and intervention. In addition, the semester system can also break through the traditional winter and summer vacation restrictions and adopt a "project cycle system" or "task driven system" to truly serve the logic of ability generation in time arrangement.

4 The Construction Path of the Third-order Collaborative Mechanism

4.1 Structural Framework of School Enterprise Student Tripartite Collaboration

The effective operation of the "three-level training model" for cross-border campuses relies on a stable collaborative structure composed of universities, enterprises, and students. As the main body of teacher education, universities are responsible for curriculum system design and educational theory guidance; As a practical platform, educational technology enterprises provide real product development scenarios and user feedback data; Students actively explore. The three parties have achieved an organic connection between the education chain, talent chain, and educational technology industry chain through the joint construction of intelligent education collaborative education bases, future teacher innovation workshops, and other platforms. The tripartite relationship is solidified through institutionalized platforms, such as co building modern industrial colleges, industry education integration innovation centers, or joint laboratories, forming a normalized communication mechanism. Under this framework, the efficient circulation of information flow, resource flow, and capability flow is achieved. Enterprises provide feedback on industry technology trends and talent capacity gaps, and universities adjust their teaching content accordingly; Students validate their learning through practice and propose innovative solutions, which in turn contribute to the technological upgrading of enterprises; Enterprises gain long-term development momentum through talent reserves and technological cooperation. Ultimately, we will build a community of shared destiny that deeply integrates the education chain, talent chain, and industry chain.

4.2 Collaborative Teaching Mechanism between Teachers and Enterprise Mentors

In the traditional model, university teachers focus more on imparting knowledge, while enterprise mentors undertake skill demonstrations, lacking the integration of teaching philosophy and methods. In the three-stage training system, both parties should jointly formulate teaching objectives, design teaching content, guide the implementation process, and conduct joint evaluations. Specifically, during the theoretical learning stage, enterprise mentors can help students understand how technology design responds to children's learning patterns through lectures on the educational logic behind educational products; In the practical stage of enterprises, university teachers regularly participate in project reviews to guide students to reflect on the advantages and disadvantages of products from an educational perspective; In the stage of innovation transformation, dual mentors jointly guide students to balance "technological innovation" and "teaching practicality", ensuring that the results truly serve the classroom. To ensure the quality of collaboration, it is necessary to establish a mechanism for mutual recruitment, training, and incentive of mentors. Universities can include enterprise mentors in their part-time teacher database and grant them the authority to develop courses and recognize credits; Enterprises can establish an "Education Contribution Award" to recognize the educational investment of technical experts. At the same time, regular school enterprise teaching seminars should be held to promote mutual understanding between educational language and engineering language, and to promote the formation of a teaching culture that emphasizes both academic rigor and industrial practicality.

4.3 Resource Sharing Mechanism

Cross border campuses need to break organizational boundaries and promote the two-way flow of academic resources such as university laboratories, libraries, and online courses with industrial resources such as production lines, research and development data, and market channels of enterprises. On the one hand, universities open up resources and facilities to enterprises to support their technological breakthroughs and employee training; On the other hand, enterprises open up real work scenarios, project databases, and engineering toolchains to students. Typical practices include co building training bases and building digital resource cloud platforms for teachers, students, and enterprise engineers to access as needed. In addition, human resources should also be included in the scope of sharing. University research teams can undertake horizontal projects of enterprises, and graduate students can join enterprise R&D centers for joint research and development; Enterprise engineers participate in course construction, graduation defense, and even serve as thesis reviewers. Resource sharing can reduce costs for all parties and generate new possibilities for cooperation through frequent interactions, such as joint application for key research and development plans, joint construction of technology transfer centers, etc., extending collaboration from talent cultivation to scientific and technological innovation and social services.

4.4 Collaboration Mechanism Driven by Projects

Different from traditional course assignments or simulated training, the project driven mechanism focuses on the actual needs of enterprises or social pain points, requiring student teams to complete the entire process from problem

identification, solution design to prototype verification in interdisciplinary and cross organizational environments. The project sources may include teaching improvement needs proposed by cooperative primary schools, lightweight product optimization tasks of educational technology enterprises, design of after-school service plans under the "double reduction" policy, and digital resource development commissions from educational public welfare organizations. The project outcome does not pursue technical complexity, but emphasizes educational generalizability. Under this mechanism, universities provide methodological guidance, enterprises endow real data, equipment, and application scenarios, and students integrate knowledge, exercise abilities, and stimulate creativity through "learning by doing". The project cycle can cover single or multiple stages, with short-term projects embedded in theoretical courses as application modules, mid-term projects running through the entire enterprise practice semester, and long-term projects extending to the innovation transformation stage, incubating as entrepreneurial entities or technological achievements. To ensure project quality, it is necessary to establish a full cycle management process of topic selection, project initiation, process monitoring, achievement acceptance, feedback iteration, and introduce third-party evaluation to ensure objectivity.

5 Conclusion

In summary, the implementation of the three-stage training model of "theoretical learning enterprise practice innovation transformation" in cross-border campuses for primary education majors needs to be based on the fundamental principles of teacher education and meet the new demands of educational digitization. In the future, we should further strengthen the educational appropriateness of time allocation and the normalized operation of collaborative mechanisms, promote the transformation of teacher training from adaptive education to innovative education, and provide new forces with educational wisdom for the high-quality development of basic education.

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