

Research on the Teaching Reform of Frontend Programming Courses in Universities Based on the Cultivation of New-Quality Talents

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Abstract: In recent years, with the high-quality development of the social economy and the continuous emergence of new-quality productive forces, higher requirements have been put forward for the teaching of frontend programming courses in universities. As a core field connecting users and digital technology, the teaching reform of frontend programming not only involves the imparting of technical skills but also focuses on enhancing students' comprehensive literacy. Therefore, universities should assume their due educational responsibilities, transform their educational concepts, and promote the teaching reform of frontend programming courses to comprehensively improve the effectiveness of curriculum education, form a good ecology of collaborative education, and thus cultivate high-quality talents that meet the development needs of new-quality productive forces. In this regard, this paper first elaborates on the significance of the teaching reform of frontend programming courses in universities based on the cultivation of new-quality talents, and then proposes a series of effective teaching reform strategies, aiming to provide certain references for relevant researchers.

Keywords: Cultivation of new-quality talents; Universities; Frontend programming; Teaching reform

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1. Introduction

Currently, frontend programming is a key technology in digital application user interfaces, and its update and development speed is relatively fast, which also places high requirements on workers' innovative thinking and technical capabilities. As an important force leading the development of new formats and models, new-quality talents not only possess solid professional skills but also have strong innovative thinking and team collaboration capabilities. Therefore, universities reform the teaching of frontend programming courses closely around the cultivation of new-quality talents. In addition to achieving the expected teaching goals and enhancing students' comprehensive literacy, they also actively fulfill the era's mission of helping the development of the digital economy and serving national strategies.

2. Significance of the teaching reform of frontend programming courses in universities based on the cultivation of new-quality talents

2.1. Conducive to adapting to the reform needs of emerging industrial forms

With the rapid development of science and technology, emerging technologies such as the Internet of Things, artificial intelligence, and cloud computing have continuously emerged and been widely applied in the frontend programming industry, spawning a large number of new formats and models, such as cross-platform application development and intelligent interaction design. Emerging industrial forms have high requirements for frontend programming talents: they not only need to have a solid professional foundation but also strong professional skills, practical literacy, and innovative thinking^[1]. By reforming the teaching of frontend programming courses based on the cultivation of new-quality talents, universities can introduce real enterprise projects, industrial standards, and the latest development trends into the curriculum system, innovate and optimize teaching methods and content, ensure that students learn and master the latest core knowledge and technologies, cultivate high-quality talents highly compatible with new formats and models, effectively solve the problem of insufficient talent supply in emerging industries, and lay a solid talent foundation for industrial transformation and upgrading^[2].

2.2. Conducive to reshaping the form of teaching interaction

By introducing technical means such as virtual simulation experiment platforms, online collaborative development tools, and interactive programming environments, universities can build a new teaching interaction ecology of “teacher guidance—student-centered—technology empowerment—real-time feedback”. For example, using real-time collaborative programming tools, students can jointly participate in code writing, debugging, and optimization in class, while teachers can real-time view the programming process of each student, provide immediate guidance for problems such as grammatical errors and logical loopholes they encounter, realizing the transformation from “one-to-many” to “one-to-one” precise interaction^[3–5]; with the help of virtual simulation projects, students can immersively experience the entire process of frontend development, collaborate with virtual roles to complete tasks such as demand analysis, interface design, and code development in a simulated real enterprise development scenario, and improve practical perception through multi-dimensional interactive feedback; at the same time, learning platforms based on big data analysis can record students’ learning behavior data, such as code submission frequency, error type distribution, and knowledge point mastery time. Teachers dynamically adjust the teaching rhythm and content focus based on these data, and design personalized learning paths and tutoring plans, making teaching interaction more targeted and effective.

2.3. Conducive to stimulating students’ independent learning and innovative potential

In traditional curriculum teaching, most students are in a passive learning state, resulting in their lack of innovation ability and learning motivation. Under the orientation of cultivating new-quality talents, teachers will not only introduce various teaching methods but also transform real cases in enterprises into teaching resources, effectively changing students’ learning state and encouraging them to carry out independent learning activities. In addition, teachers will organize diverse classroom teaching links to activate students’ innovative potential, such as affirming the innovative views put forward by students in design projects and encouraging students to boldly try different design ideas and technical schemes^[6–8]. In this way, the student-centered teaching concept can be implemented throughout the teaching of frontend programming courses, fully activating students’ internal motivation, effectively cultivating their innovation ability and independent learning ability, laying a solid foundation for cultivating new-quality technical talents with innovative spirit and practical ability, and thus

injecting inexhaustible talent momentum into promoting the development of new-quality productive forces.

3. Teaching reform strategies of frontend programming courses in universities based on the cultivation of new-quality talents

3.1. Reconstruction of teaching content and construction of a three-level curriculum system

From the perspective of cultivating new-quality talents, universities should closely align with the job requirements of frontend programming and industrial development trends, break through the traditional curriculum teaching model, and construct a three-level curriculum system of “basic layer—core layer—innovation layer”^[9]. First, the basic layer mainly includes the use of frontend development tools and core syntax, such as JavaScript asynchronous programming and the application of HTML5 semantic tags, with corresponding basic practical exercises to ensure that students can effectively understand and master basic knowledge and skills.

Second, the core layer is project-driven, integrating core technical modules and setting progressive project tasks, such as the design of interactive functions of online teaching platforms and the development of e-commerce homepages. This encourages students to master core skills in the process of completing project tasks, guides them to establish a correct engineering concept, and enhances their problem-solving abilities.

Third, the innovation layer focuses on interdisciplinary integration and cutting-edge technologies, striving to break the barriers between different disciplines and promote the in-depth integration of technologies such as virtual reality, artificial intelligence, and the Internet of Things with frontend technologies^[9-11]. Through the introduction of these interdisciplinary knowledge and the practice of cutting-edge technologies, students can comprehensively apply multi-disciplinary knowledge to solve complex problems, effectively enhance their innovative thinking, and broaden their technical horizons.

3.2. Innovation of teaching models: Human-machine collaboration and inquiry-based practice

First, introduce an AI teaching assistant system and build a virtual collaborative teaching platform. For example, use the virtual platform to simulate complex scenarios such as multi-terminal adaptation problems and high-concurrency user interactions. Students can flexibly use various virtual tools for performance optimization and technical debugging on the platform. Teachers can also analyze the problems and shortcomings encountered by students in virtual practice through the platform and provide them with personalized teaching guidance plans.

Second, implement the “project tutor system + interdisciplinary collaboration group” model, forming joint project teams consisting of frontline enterprise engineers, university research team tutors, and students. Conduct inquiry-based learning around socially valuable topics such as “smart campus service platforms” and “digital display of cultural heritage”^[12]. In the process of project advancement, teachers are no longer the sole imparters of knowledge but transform into organizers and guides of the learning process. By setting a complete project cycle of “demand analysis—scheme design—technology selection—development and testing—result iteration”, they guide students to actively consult literature, decompose problems, and collaborate to tackle key issues. In practice, students deepen their understanding of frontend technical principles and cultivate communication, team collaboration, and project management abilities.

Third, an online collaborative development platform can be used to build a distributed learning community, encouraging students to form teams across classes, grades, and even universities. By means of code review,

version control, and document collaboration, they simulate real enterprise development processes, and improve engineering practice literacy and innovative collaboration abilities in an open and shared learning atmosphere.

3.3. Optimization of teaching evaluation methods to guide new directions in talent cultivation

In the process of integrating production and education to serve the development of new-quality productive forces, universities deepen the overall plan for the reform of education evaluation in the new era and optimize talent cultivation evaluation methods. Specifically: First, pay attention to the implementation of process evaluation, which comprehensively reflects the abilities, attitudes, and innovative awareness in the process of cultivating new-quality talents. Schools and enterprises should jointly conduct a comprehensive evaluation of the talent cultivation process, accurately feedback students' strengths and weaknesses, and cultivate talents in a targeted manner^[13].

Second, combine qualitative evaluation. The new characteristics of new-quality talents, such as compound thinking ability and innovative thinking ability, are difficult to measure by quantitative evaluation methods. For abilities that cannot be tested with specific reference goals, such as the evaluation of students' abilities in project-based teaching, since project-based teaching focuses on reflecting students' subjectivity in the learning process, traditional evaluation methods are difficult to apply. Teachers from schools and enterprises need to use qualitative evaluation methods to record and evaluate each link of students' task completion, so as to more comprehensively reflect the abilities of each student.

Third, attach importance to the role of evaluation in promoting students' growth. The update and development speed of new-quality productive forces is very fast, requiring workers in the new era to have lifelong learning abilities. The traditional evaluation function that focuses on distinguishing advantages and disadvantages and identifying quality can no longer guide the cultivation of new-quality talents in the correct direction. Therefore, the evaluation function needs to shift to emphasizing selection, development, and incentives, so as to improve students' knowledge and skills, cultivate their fighting spirit, and promote students to continuously improve their self-growth.

3.4. Construction of an ecological system: Integration of production and education and resource integration

First, universities should take the initiative to break the barriers of school-enterprise resources. By co-building physical platforms such as "frontend technology joint laboratories" and "industrial colleges" with leading Internet enterprises and industry-leading enterprises, they introduce real enterprise development environments, project cases, and technical standards into campuses. At the same time, promote enterprise engineers and technical experts to deeply participate in the teaching process. Through a combination of "enterprise tutors teaching on campus + project tutors guiding online", they integrate cutting-edge industry technology trends, engineering development processes, and professional quality requirements into classroom teaching, making up for the shortcoming that practical links in traditional teaching are disconnected from industrial reality.

Second, integrate high-quality internal and external resources. Universities seek help from government departments, and the government, starting from special funds and preferential policies, jointly build a production-teaching-research application practice platform, which can not only provide professional guidance services for students but also facilitate students to independently carry out innovative projects and practical exercises, continuously improving their learning efficiency^[14]. At the same time, universities encourage in-depth

cooperation between research teams and enterprise R&D departments, and students participate as assistants to effectively strengthen their scientific research and innovation capabilities^[15]. In addition, establish an online resource library and upload various learning resources such as open-source community tutorials, technical documents, and online high-quality courses. To achieve interconnection of resources, students can find the learning resources they really need, and finally form a closed loop of the production-education integration ecology, thereby cultivating a large number of high-quality new-quality talents.

4. Conclusion

In summary, the teaching reform of frontend programming courses in universities based on the cultivation of new-quality talents is an inevitable requirement to respond to industrial changes and improve the quality of talent cultivation. By reshaping the form of teaching interaction, constructing a three-level curriculum system of “basic layer—core layer—innovation layer”, innovating the teaching model of human-machine collaboration and inquiry-based practice, optimizing the teaching evaluation method combining process, qualitative, and developmental evaluation, and deepening the construction of an ecological system integrating production and education and resource integration, the frontend programming course can be effectively promoted to transform from traditional knowledge imparting to ability cultivation and innovation leadership. In the future, universities need to continuously pay attention to the development trends of frontend technology and changes in industrial talent demand, dynamically adjust reform strategies, strengthen the depth and breadth of technology-empowered teaching, and strive to cultivate students’ core technical capabilities, interdisciplinary innovative thinking, and engineering practice literacy. This will transport more high-quality new-quality frontend programming talents for China’s digital economic development and industrial transformation and upgrading, helping to build an education power and a technological power.

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Disclosure statement

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References

- [1] Dai R, Zi D, He J, 2024, Practical Paths for Agricultural Universities to Cultivate “Knowledgeable, Loving and Dedicated” Talents from the Perspective of New-Quality Productive Forces. *Employment and Security*, 2024(12): 172–174.
- [2] Liu L, Wang K, 2024, Research on the Supply of University Talent Cultivation for New-Quality Productive Forces. *China University Students Career Guide*, 2024(12): 96–105.
- [3] Chi Y, 2024, Research on the Practice of University Scientific and Technological Talent Cultivation Assisted by New-Quality Productive Forces. *Journal of Jinzhou Medical University (Social Science Edition)*, 22(06): 101–103.
- [4] Wang H, 2024, Research on the Path of Cultivating Innovative Talents in Universities Under the Background of New-Quality Productive Forces. *The Guide of Science & Education*, 2024(34): 1–3.
- [5] Zheng Q, Chen H, Zheng J, 2024, Exploration of Innovative Paths for Cultivating New-Quality Talents in Universities from the Perspective of New-Quality Productive Forces. *High-Technology & Industrialization*, 30(11): 134–136.
- [6] Wang Y, 2024, Research on the Training System of Applied Innovative Talents in Universities from the Perspective of “New-Quality Productive Forces”. *Proceedings of the 2024 Academic Annual Conference of Henan Private Education Association (Volume 1)*, Qingdao University of Technology, 66–67.
- [7] Guan F, Li W, Zhang G, 2024, Research on the Path of Cultivating Talents in Applied Undergraduate Universities Under the Background of New-Quality Productive Forces. *The Guide of Science & Education*, 2024(31): 13–15.
- [8] Sun Y, 2024, Research on the Path of University Innovative Talent Training Model from the Perspective of New-Quality Productive Forces. *Talent Intellige*, 2024(31): 157–160.
- [9] Wei Y, Qiao Q, 2024, Realistic Dilemmas and Optimization Strategies for Cultivating Top Innovative Talents in Universities from the Perspective of New-Quality Productive Forces. *Modern Education Management*, 2024(12): 11–19.
- [10] Chang C, Zhang Y, 2024, Practical Paths for New-Quality Productive Forces to Empower the Cultivation of Innovative Talents in Universities. *Shanxi Science and Technology News*, 2024-10-18(B03).
- [11] Qin Y, 2024, Challenges and Innovative Paths for Talent Cultivation in Applied Universities Under the Background of New-Quality Productive Forces. *Proceedings of the “2024 International Forum on Higher Education” - Technological Innovation and Sustainable Development*, Henan University, 88–95.
- [12] Fan M, 2024, Internal Logic and Implementation Paths of New-Quality Productive Forces Boosting the Cultivation of Innovative Talents in Universities. *Proceedings of the “2024 International Forum on Higher Education” - Technological Innovation and Sustainable Development*, Henan University, 81–87.
- [13] Zhang X, Si Y, 2024, Digital Empowerment of University Talent Cultivation from the Perspective of New-Quality Productive Forces: Theoretical Framework and Practical Paths. *Education Observation*, 13(28): 103–105.
- [14] Xie D, 2024, University Talent Training Model Under New-Quality Productive Forces: Connotative Characteristics, Formation Logic and Practical Orientation. *Military Higher Education Research*, 47(03): 50–57.
- [15] Yang X, Ma W, 2024, Transformation Requirements and Responses of University Talent Cultivation by New-Quality Productive Forces. *Socialist Forum*, 2024(09): 55–56.

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