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Analysis and Research on the Effectiveness of Computer Teaching in Colleges and Universities

Qisheng Dou*

College of Child Development and Education, Zhejiang Normal University, Hangzhou 311231, China

***Corresponding author:** Qisheng Dou, hzxdqs@163.com

Abstract: With the deepening of curriculum reform, computer courses are becoming more and more important in the higher education system. To improve the effectiveness of computer teaching has become a topic of particular concern to many educators. This paper aims to build an efficient computer classroom, based on the current situation of computer teaching, summarizes and puts forward many strategies and suggestions to improve the effectiveness of computer teaching in colleges and universities, to provide a new idea and perspective for the reform and innovation of computer teaching, and promote the high-quality development of the overall computer teaching in colleges and universities.

Keywords: Universities; Computer teaching; Effectiveness

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1. Introduction

With the rapid development of information technology, computers have gradually become a necessary tool to enable the development of all walks of life. As an important base for the cultivation of outstanding talents, colleges and universities shoulder the key tasks of knowledge imparting and skill training. There is no doubt that the overall teaching effect of computers directly affects the students' technical level in computer, and is closely related to the student's future employment competitiveness. However, looking at the current situation of computer teaching, most teachers still blindly adopt a single, traditional teaching mode, which leads to unsatisfactory teaching effects and makes it difficult to meet the diversified learning needs of students. Based on this, it is very important to reform and innovate the computer teaching mode fundamentally and improve the effectiveness of teaching.

2. The current situation and existing problems of computer teaching in colleges and universities

Nowadays, there are still a series of serious problems to be solved in the teaching of computer courses in colleges and universities, which not only directly affect the information technology level and information

literacy training of college students, but also restrict their future career development. The proposed and in-depth implementation of the new curriculum standards effectively promotes the reform and development of computer teaching in colleges and universities. Many colleges and universities have achieved remarkable results in the reform of computer teaching, but some colleges and universities still face many puzzles and problems. Based on this, the author elaborated on the problems and shortcomings of computer teaching in colleges and universities from the following aspects, to comprehensively improve the quality of computer teaching and promote its high-quality development in colleges and universities.

2.1. Slow updating of teaching content

In the 21st century, society is experiencing the baptism of networking, digitization, and information technology. Emerging technologies represented by artificial intelligence, big data, Internet of Things technology, and cloud computing are penetrating more and more industries and have been widely used [1]. Information technology has been closely related to people's studies and lives, and it is inseparable. However, at present, the teaching contents of some computer courses in colleges and universities fail to fully reflect these cutting-edge technical contents.

In addition, the teaching contents of some computer courses in colleges and universities may be outdated, lagging, and face other problems, which makes it difficult to meet the urgent needs of students to master the latest technology. Similar problems not only affect the students' initiative in learning but also may restrict the cultivation and development of students' information literacy [2]. Moreover, the explanation of basic theories is important, but overemphasis on theories and neglect of practical exercises may also be one of the main causes of the current lagging in teaching content. To fundamentally change this teaching situation, colleges and universities need to review the teaching content of computer courses in time and make greater efforts to update them. More importantly, they should actively introduce cutting-edge technical content and innovative ideas. Only in this way can they ensure that college students can adapt to the rapid changes of the information society smoothly after graduation, and at the same time, they can flexibly respond to many challenges brought by information work.

2.2. Backward teaching methods and approaches

Some computer science teachers continue to rely on traditional methods, such as lectures and basic experimental operations. These approaches may not foster an active classroom environment. Additionally, the lack of teacher-student interaction hinders the development of students' independent learning skills, ultimately leading to lower teaching efficiency. The root cause of this issue lies, on the one hand, in the teachers' failure to adopt "Internet +" and "student-centered" teaching philosophies. On the other hand, it may be influenced by the teachers' limited proficiency in utilizing technology-based teaching tools, resulting in lower classroom quality and effectiveness. In today's educational environment, digital tools and rich online resources—such as Massive Open Online Courses (MOOCs), virtual laboratories, and interactive programming platforms—are scarcely utilized, limiting students' ability to improve [3].

2.3. The content is out of touch with actual needs

According to surveys, the content design of computer courses in some colleges and universities tends to be overly theoretical and not closely aligned with industry demands [4]. This is evident in the fact that some institutions place too much emphasis on theoretical knowledge while neglecting practical, enterprise-related

projects. As a result, students often have limited opportunities to engage with real-world work environments during their studies and lack hands-on experience with actual industry projects. This disconnect can hinder graduates' employment prospects and their ability to innovate or pursue entrepreneurship. Moreover, it is important to recognize that talent in the computer field requires not only strong technical skills but also excellent teamwork and problem-solving abilities. However, many colleges and universities fail to adequately train students in these areas, which could lead to graduates being unprepared for the workforce and potentially being overlooked by employers. This gap may negatively impact their long-term career development [5].

3. Strategies and suggestions for improving the effectiveness of computer teaching in colleges and universities

3.1. Enhancing teachers' skills and competence

Teachers play a crucial role in imparting knowledge, guiding students' learning, developing their personalities, and stimulating creative thinking. The quality of a teacher's skills and accomplishments is closely related to the success of computer teaching reforms and is significantly connected to students' learning outcomes and future career development [6]. With the rapid evolution of the computer industry, teachers must continuously improve their professional skills and teaching quality to enhance the effectiveness of computer education.

Firstly, teachers should consistently update their knowledge base through lifelong learning. For instance, they should stay current with the advancements in the computer industry, understand the latest trends in cutting-edge technologies, and actively participate in workshops, seminars, international conferences, and industry training programs. By deepening their research and familiarizing themselves with the most recent theoretical knowledge and practical applications, teachers can continuously elevate their professional level [7].

Secondly, colleges and universities should establish a tiered and segmented teacher training system, with reformed methods to cater to the diverse and individualized learning needs of students at various stages. For teachers who are new to academia, institutions should provide structured and comprehensive training in computer-related knowledge and skills, helping them build a solid foundation to teach cutting-edge concepts and technologies. For more experienced teachers, universities should leverage school-enterprise cooperation platforms to send them to businesses for regular training or practical experience. Alternatively, teachers can use their winter and summer breaks for internships in technical roles within enterprises, allowing them to stay up-to-date with new technologies. This experience enables teachers to bring fresh insights and resources into the classroom, enriching students' learning experiences through the exchange of real-world knowledge [8].

3.2. Traditional computer teaching and interdisciplinary integration

Traditional computer science teaching often focuses exclusively on computer knowledge and skills, overlooking the importance of interdisciplinary learning and application. However, computer science is a highly applied field, intricately linked to disciplines such as mathematics, physics, biology, medicine, art, and many others [9]. Therefore, interdisciplinary teaching has become a key trend in computer education reform and is one of the most effective strategies to enhance the quality of computer education. This approach helps students develop problem-solving skills and fosters a well-rounded understanding of complex issues.

Firstly, in practice, teachers should guide students to explore knowledge from related fields, such as mechanical engineering and electrical engineering. By doing so, students not only become proficient in computer science but also gain a broader understanding of areas like mechanical structures and electrical

systems that are closely connected to computer technologies. This interdisciplinary knowledge lays a strong foundation for student's future growth as well-rounded engineers [10]. Interdisciplinary learning greatly enhances students' ability to integrate and apply knowledge from different fields, enriching their experience in solving complex, cross-disciplinary problems and preparing them for future careers.

Secondly, teachers should encourage students to actively engage in interdisciplinary projects. By working on real-world problems through collaborative projects, students not only strengthen their computer skills but also benefit from shared knowledge across different fields. For example, in a smart home system development project, students from computer science, electronic engineering, and communication engineering can collaborate, honing both their interdisciplinary communication and problem-solving skills. This approach benefits students in multiple ways, including preparing them for complex, real-world challenges [12].

Finally, educators should work with teachers from other disciplines to organize interdisciplinary lectures or seminars. Schools can also invite experts and scholars from both computer science and other fields to share their experiences, discuss industry developments, and engage in direct conversations with students. For example, having a mechanical engineer discuss automated control systems can provide students with a more concrete understanding of how computer technology integrates with mechanical engineering. This collaboration helps to spark students' interest and motivation, creating a strong foundation for improving the overall effectiveness of computer education [13].

3.3. The establishment of smart classrooms for computer education

With the rapid advancement of information technology, traditional teaching methods no longer fully meet the demands of modern computer education. In response to this, the concept of the "smart classroom" has emerged. The creation of smart classrooms integrates various cutting-edge technologies such as virtual simulation, artificial intelligence (AI), and big data. By blending these technologies with computer-related activities, smart classrooms provide interactive learning environments for students while offering intelligent tools for teachers to enhance every aspect of teaching. This significantly improves the overall effectiveness and efficiency of education.

Smart classrooms utilize computer networks, multimedia technologies, and intelligent management systems to guide students through programming practice, software testing, algorithm exercises, and more via online platforms. Big data analysis enables personalized learning suggestions for students, and teachers can monitor their progress in real-time. This allows educators to adapt their teaching strategies based on student's individual needs, helping to achieve more personalized and effective learning outcomes.

One key feature of smart classrooms is the virtual simulation experiment platform. Before the implementation of smart classrooms, teachers were unable to dynamically manage students' practice sessions or analyze relevant data in detail. Moreover, students were required to complete experiments within a limited time, which often resulted in unfinished work, thereby reducing the quality and efficiency of computer education.

With the Browser/Server (B/S) architecture-based EVE-NG online simulation platform, smart classrooms can now offer dynamic student management. Students can continue working on programming, testing, and training tasks outside of the classroom, while teachers monitor their progress in real time through a centralized system. This setup increases student initiative and engagement in practice, ultimately leading to better learning outcomes and higher teaching effectiveness [14].

3.4. Optimizing and integrating computer teaching content

Computer-related professions are highly practical and closely aligned with societal needs. Therefore, the teaching content of computer courses in colleges and universities must also be geared toward real-world applications and reflect these practical characteristics to meet the job requirements of industries and enterprises. However, the current content of computer education in many colleges and universities is often limited to the formal syllabus for full-time students and is not sufficiently aligned with the specific needs of various industries. As a result, there is a disconnect between computer teaching and the actual demands of the industry.

To address this, colleges and universities should strive to align their computer course systems with the specific needs of different sectors and continuously optimize and integrate the teaching content. On one hand, core courses such as computer fundamentals and computer networks should remain standardized to ensure that students acquire a solid theoretical foundation in computer science. On the other hand, elective courses should be updated regularly to keep pace with technological advancements and industry demands. This is especially important for emerging fields like artificial intelligence, big data, and cloud computing [15].

Furthermore, practical application and skills training should be central to the teaching system. Universities should focus on utilizing high-quality industry resources by establishing internal and external practice bases in collaboration with businesses. By jointly developing courses with industry partners, colleges can enhance students' practical skills, improve their competitiveness in the job market, and lay a strong foundation for future employment and entrepreneurship.

4. Conclusion

In conclusion, colleges and universities, as key institutions for training outstanding talent across various fields, should design computer courses that keep pace with modern advancements and align with the needs of students, aiming to meet the job market demands for future graduates. Implementing measures such as enhancing teachers' skills and qualifications, emphasizing interdisciplinary application and collaboration, establishing smart computer classrooms, and optimizing and integrating computer teaching content will collectively improve the quality and effectiveness of computer education. These efforts will support the smooth advancement of computer education reform.

Disclosure statement

The author declares no conflict of interest.

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