Innovation and Optimization of College Students' Ideological and Political Education System Based on Digital Education Technology

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Abstract: With the gradual progress of higher education, the ideological and moral construction of college students has become an important and urgent task of school education. It is not only required to cultivate and improve students' scientific and cultural qualities, but also to achieve the goal of comprehensive development and advance socialist modernization. However, due to traditional concepts, many schools face problems in carrying out Ideological and Political Education (IPE) for college students, such as monotonous teaching methods. The lack of innovation directly affects the effectiveness of IPE, leading to insufficient understanding of the contemporary social situation and even a certain degree of rebelliousness. As the most widely used modern information technology in education, digital education technology has advantages of being advanced, efficient and convenient, helping college students better master modern knowledge and cultivate abilities to use and learn technology to solve practical problems, and effectively enhance learning interest. Based on the principle of gray level cross-correlation, this paper takes image segmentation methods and related algorithms as an example to study common digital image features in IPE digitalization and give corresponding processing strategies. Finally, the design of an IPE digital platform based on gray correlation theory is realized to effectively improve IPE. This paper also compares traditional teaching methods with the IPE system under digital education technology. The results show that the reformed education system is more in line with the current situation, helping cultivate the knowledge and skills needed for social development, with student performance improved by about 3.08%. Scientific programming and intelligent digital education systems can not only meet students' daily learning needs, but also provide richer services, promoting informatization of IPE, a harmonious campus, and a socialist harmonious society.

1. Introduction

As the backbone of social construction, university students have distinctive characteristics of the times. Moral education for college students is a key part of talent training in schools. In a

prospering market economy and booming digital modernization, the reform of higher education is deepening, which provides opportunities for contemporary college students to grow, but also brings challenges. To carry out IPE in this new situation, people need to strengthen students' ideological and political theory learning, education of ideals and beliefs, as well as focus on their ideological and moral cultivation, guiding them to become qualified talents with all-round development of morality, intelligence, physique, and beauty. Therefore, it is especially important to improve the effectiveness of moral education, integrating its concept into the entire teaching system to better play its role.

IPE has always been an important part of university teaching, and many scholars have conducted relevant research. Jiang Haixin introduced the connotation and characteristics of online public opinion in schools, discussing innovation in IPE concepts, contents, and methods under this background to ensure its positive role [1]. Zhang Ming analyzed ideological data of college English teaching in the current context from cognitive ability, environment, and measures, proposing useful methods to consolidate ideological security from five aspects, including ideological understanding, language ontology, and political guidance [2]. Wang Xiaoshu researched the integration of music teaching and IPE, analyzing its promotion and necessity, and constructed an integration model to weaken wrong influences in data [3]. Li Yue studied the value orientation of recessive IPE, suggesting it should be based on college students' groups and social reality, focusing on teacher-student emotional communication and value leadership, enhancing their humanistic quality and sense of social responsibility [4]. Zheng Pengyi, using the information security course as an example, integrated science and security laws into practice, forming a curriculum system combining IPE with course content, while cultivating socialist core values [5]. Xu Liyun's research found the realization of IPE through red films requires joint efforts of schools, students, and film subjects, building a complete and efficient network culture communication mechanism [6]. IPE of college students should not only focus on theoretical education and propaganda, but also on diversified activities to promote all-round student development.

Intelligent digital education has injected new vitality into IPE. Neil Selwyn preliminarily explored digitalization and informatization of higher IPE, realizing a transformation from traditional thinking to modern knowledge learning, providing students a platform to cultivate humanistic quality and practical ability [7]. Wang Yuting built a college IPE system based on mobile AI terminals, solving problems of teaching content and methods from the perspective of students' learning psychology and providing theoretical guidance for system improvement [8]. Xiao Junhong investigated the digitalization strategies of 75 top universities, pointing out that digital education is a new way of learning, promoting closer ties between schools and society by re-integrating existing knowledge systems [9]. McGarr Oliver analyzed digital technology policy in IPE from 1997 to 2017 to identify reasons for the failure of past attempts and provide reference for future policy iterations [10]. Suoranta J analyzed the challenges under COVID-19, discussing intelligent digital education's value for student learning, teacher teaching, and social development, offering a reference for better use of digital resources [11]. He Jianping discussed opportunities for network IPE under the digital environment, reflecting on existing problems and proposing countermeasures to improve its level in schools [12]. Digital education has become an important trend in higher education reform. IPE should conform to this trend, innovate application means, build efficient classrooms, expand curriculum resources, and enhance students' comprehensive quality to improve teaching quality and effects.

In the context of educational reform, the shortcomings of traditional teaching concepts and methods lead to low student motivation and cannot effectively improve teaching quality. This requires teachers to innovate and improve teaching methods, using modern information technology to make abstract and complex content vivid, turning the classroom into a place for mutual

communication and cooperation between teachers and students. This article mainly starts with the common problems in IPE in universities and analyzes optimized teaching strategies by combining intelligent education tools, including strengthening curriculum resources, building good teaching models, enriching teaching contents, and expanding resources. In this way, the overall development of college students' comprehensive quality can be promoted, helping them better adapt to the needs of the times and maximize their own value.

2. Innovation of College Students' IPE System Based on Digital Education

(1) Application of digital education technology

In the era of the knowledge economy, society's demand for high-quality talents is constantly rising, and school education is gradually being reformed. Digital information technology is increasingly integrated into education, changing traditional teaching modes and focuses, and is significant for promoting teachers' professional development and knowledge upgrading. Digital education technology, as an emerging teaching mode in recent years, is based on digital learning, integrating, transforming, and applying knowledge imparted by teachers and relevant information obtained by students through computers and networks. This enables students to master more knowledge and improve their comprehensive ability through independent inquiry, cooperation, and communication.

Digital education is also an application of artificial intelligence in education. Its main purpose is to enhance students' interest in information technology and curriculum learning, and promote closer contact between teachers, students, and society [13]. Specifically, the advantages of adopting digital teaching modes in university classrooms to improve the teaching environment and enhance learning effectiveness are analyzed from both teacher and student perspectives. Teachers can share and make full use of information resources through digital devices in teaching.

Classroom teaching under the digital mode helps teachers overcome limitations of traditional methods, such as ineffective use of information resources and poor teacher-student communication. It also makes school management more flexible and convenient, enabling teachers to grasp the latest trends in a timely manner. Secondly, the digital mode promotes college students' learning enthusiasm. They need broader knowledge to enrich their horizons, shifting from passive acceptance to active exploration, and in this process, continuously improving self-cognitive ability and creative thinking. Digital education technology also helps students form correct learning attitudes, enhance practical abilities, and improve learning effects. Finally, with the maturity of computer technology, its applications have expanded, including intelligent networks, virtual reality, and more, which impacts traditional teaching to a certain extent. Therefore, implementing digital teaching in college classrooms is a good choice.

(2) Characteristics of IPE in universities

Table 1 Characteristics of university thinking and political education

	Features	Performance
Behavior	Ethical behavior	Development of students' independent learning skills
Psychological	Democratic consciousness	Students are involved in the organization and management of the class and school
	Personality independence	Awareness of the theme among college students is awakened and recognized and understood by the community
	Pragmatic and rational	Focus on practical work, active and aggressive, the pursuit of effective

The characteristics of IPE in universities are mainly reflected among college students. School, family, and society together form a new model of joint education involving colleges, parents, and student-teacher collaboration, with the school as the core subject guiding, organizing, and implementing moral education. This specifically requires efforts in curriculum teaching and campus culture construction. It is necessary to innovate and reform IPE theory teaching, optimize curriculum system design, enrich after-school activity forms, improve the evaluation mechanism, and enhance its adaptability to social development. Specific performance characteristics are shown in Table 1.

The main characteristics of IPE in universities include the continuous improvement of moral behavior, enhanced democratic consciousness, cultivation of independent personality, and the growing popularity of pragmatic and rational values. Improved morality is mainly reflected in cultivating good moral behavior, spreading advanced ideas, and establishing a correct outlook on life. Strengthened democratic consciousness lays the foundation for students' self-cultivation and the formation of socialist core values, enhancing their sense of ownership and mission through active participation in social life, cultivating interests, and strengthening self-confidence, enterprising spirit, and self-reliance. The cultivation of independent personality supports students' healthy growth, sound personality, and self-regulation, helping achieve talent training goals. Popularizing pragmatic and rational values raises awareness of social problems and moral deficiencies, fostering high-quality talents with innovative ability and a healthy, positive attitude. As higher education expands and deepens, college students show increasingly diverse characteristics. Traditional exam-oriented education no longer meets modern requirements, making quality-oriented moral education an important topic for schools. The construction of IPE platforms is therefore imminent [14].

(3) Problems in IPE in universities

IPE is crucial for improving students' comprehensive quality, enhancing their social responsibility, and promoting socialist development. It directly affects college students' growth and future. With the rise of new media in schools, digital information technology has become indispensable for students. Meanwhile, the diversification of thoughts makes IPE reform urgent. However, there are still many deficiencies, including low quality and single teaching methods, hindering a positive educational atmosphere. Active and effective improvements are needed based on strengthened theoretical research.

First, students have weak ideological and political awareness and no clear values. In their initial growth stage, they may become confused and develop inferiority or rebellious attitudes after setbacks, losing their enterprising spirit and responsibility, leading to passive school life. Second, the shortage of teachers due to regional economic imbalance, market mismatches, and slow vocational education has resulted in small schools, weak faculties, poor resources, and low student quality, restricting healthy education development. Third, outdated, impractical, and repetitive textbooks with insufficient theoretical depth hinder IPE. Finally, single teaching methods remain a major challenge. To address this, innovative models are needed to meet modern demands. Traditional classrooms lack smooth information exchange and interaction. Under curriculum reform, cultivating students' innovative thinking is key, and digital media offers a good platform. Integrating IPE with social practice in the new era deserves further exploration [15].

(4) Innovation path of college students' IPE system based on digital education

IPE is crucial in schools, serving as the core of ideological and political work and a foundation for students' holistic development. With changing times, higher demands are placed on IPE, requiring innovation and reform to build an improved system that cultivates complex talents with social responsibility, cultural literacy, and adaptability. Digital media technology has broadened students' horizons, improved their information literacy, and transformed traditional single teaching

methods into diversified models. The innovation path of college students' IPE based on digital education is shown in Figure 1.
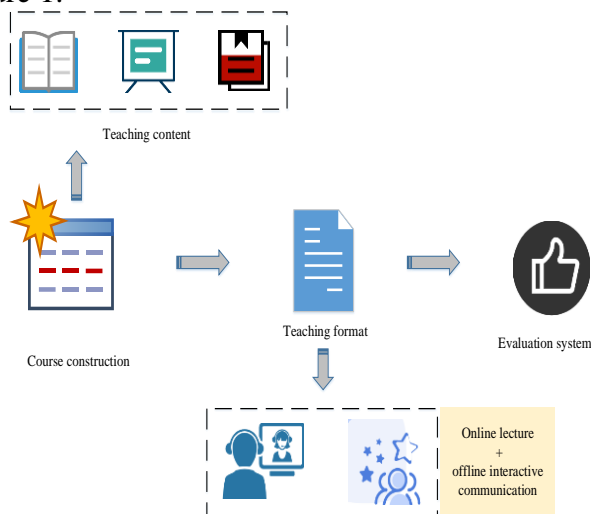

Figure 1 IPE system of college students based on digital education

From traditional to digital teaching, and then to online and virtual learning, modern educational technology has deeply influenced education, impacting conventional methods. A student-centered approach is therefore essential, focusing on cultivating active participation. Teachers integrate digital technologies into classroom processes, building models based on the Internet to help students better master knowledge and skills for future work. Curriculum content can be classified as basic, professional, and expanded, implemented through matching teaching strategies. Integrating resources and social practices makes the curriculum more attractive and helps students experience learning joy and achievement. Teaching methods combine online instruction with offline communication to enhance students' understanding and cognition of IPE, making learning more engaging.

In addition, virtual environments and technologies enable real-time interaction, vivid teaching, and overcome the limitations of traditional resources, providing modern educational services. This offers new directions for reforming ideological and political theory courses. Overall, an integrated IPE innovation system based on digital and network technologies can promote students' comprehensive development, address the lack of core literacy, and enhance practical ability, lifelong learning, and responsibility awareness. This model suits not only ideological and political courses in vocational colleges but also other relevant courses.

(5) Intelligent digital education and application of scientific programming technology

In the age of computers and the Internet, people's lifestyles have changed drastically and there is also a greater demand for education. Especially in the university stage, the learning method has changed from traditional classroom and teacher teaching to online teaching. Under this background, the online open curriculum system based on the Internet came into being. Intelligent digital education and scientific programming technology provide basic conditions and platform support for the realization of online open courses.

The intelligent digital education system is a teaching platform integrating computer, network, and multimedia technologies. It combines traditional teaching with modern information technology, effectively improving students' learning efficiency and enabling teachers to optimize classroom structure and promote teaching quality. As a new major, scientific programming technology has strong practicality and applicability. In current IPE teaching, it helps learners find and analyze target knowledge more accurately. Through mathematical modeling, teaching content is further

improved, stimulating students' exploration and innovation, and making the classroom atmosphere more vivid. Computer programming also plays an important role in real life, such as simulating social phenomena and understanding developmental laws and trends. Thus, applying computer intelligence to IPE offers new ideas for college talent training. Smart classrooms and smart campuses have moved beyond concepts into practice. Informatization construction is driving the reform of ideological and political courses, transforming higher vocational education from exam-oriented to quality education, and cultivating application-oriented innovative talents.

3. Education Innovation Based on Digital Education Technology

(1) Two-dimensional normalized gray level cross-correlation method

If there is an original image M, the template image obtained through algorithm matching is N, (m, n) is defined as the center point of the original image, and (i, j) is the pixel point in the matching template, then $M_{(m,n)}$ is the search sub image in the original image, $M_{(m,n)}(i, j)$ is the gray value of $M_{(m,n)}$ at point (i, j), and $N(i, j)$ is the gray value of the matching template at point (i, j). The mean value expression is:

$$\overline{M_{(m,n)}} = \frac{1}{ab} \sum_{a=1}^{a} \sum_{b=1}^{b} M_{(m,n)}(i, j)$$

(1)

$$\overline{N} = \frac{1}{ab} \sum_{a=1}^{a} \sum_{b=1}^{b} N(i, j)$$

(2)

In the formula, a and b represent the number of rows and columns of the image respectively.
Then the normalized cross correlation coefficient of the mean value is:

$$\lambda(m, n) = \frac{\sum_{a=1}^{a} \sum_{b=1}^{b} \left[M_{(m,n)}(i, j) - \overline{M_{(m,n)}} \right] \times \left[N(i, j) - \overline{N} \right]}{\left\{ \sum_{a=1}^{a} \sum_{b=1}^{b} \left[M_{(m,n)}(i, j) - \overline{M_{(m,n)}} \right]^2 \right\}^{\frac{1}{2}} \times \left\{ \sum_{a=1}^{a} \sum_{b=1}^{b} \left[N(i, j) - \overline{N} \right]^2 \right\}^{\frac{1}{2}}}$$

(3)

The closer the value of $\left| \lambda(m, n) \right|$ is to 1, the better the matching degree between the search sub graph and the template is, and the easier it is for digital education technology to help learners apply relevant knowledge in the process of IPE.

Formula 3 requires too much calculation. In practical applications, information related to the template can often be calculated in advance and stored in the digital system, such as:

$$N_0(i, j) = N(i, j) - \overline{N}$$

(4)

$$Q_N = \left\{ \sum_{a=1}^{a} \sum_{b=1}^{b} \left[N(i, j) - \overline{N} \right]^2 \right\}^{\frac{1}{2}}$$

(5)

In this case, Formula 3 can be simplified as:

$$\lambda(m, n) = \frac{\sum_{a=1}^{a} \sum_{b=1}^{b} \left[M_{(m,n)}(i, j) - \overline{M_{(m,n)}} \right] \times N_0(i, j)}{\left\{ \sum_{a=1}^{a} \sum_{b=1}^{b} \left[M_{(m,n)}(i, j) - \overline{M_{(m,n)}} \right]^2 \right\}^{\frac{1}{2}} \times Q_N}$$

(6)

The improved intelligent digital education system has faster computing speed and higher operating efficiency. It can not only effectively solve the problems existing in traditional education methods, but also adapt to modern teaching needs and changes in students' learning psychology, and promote the reform and development of quality education.

(2) One dimensional gray projection cross correlation method

The sum of gray levels of each column of pixels in the search sub graph $M_{(m,n)}$ after averaging is calculated:

$$S_{(m,n)r} = \sum_{i=1}^{a} \left[M_{(m,n)}(a,r) - \overline{M_{(m,n)}} \right]$$

(7)

Therefore, the correlation number at this time is:

$$\lambda(m,n) = \frac{\sum_{k=1}^{b} S_{(m,n)k} \times N_k}{\left\{ \sum_{k=1}^{b} S_{(m,n)k}^{2} \right\}^{\frac{1}{2}} \times \left\{ \sum_{k=1}^{b} N_k^{2} \right\}^{\frac{1}{2}}}$$

(8)

Among them, k represents the number of columns ($k = 1,2,...b$), and N_k is the internal resistance elements of the template grayscale projection array, which can be obtained by the same way from Formula 3. The point with the maximum of $|\lambda(m,n)|$ is the best matching point.

4. Comparative Experiment before and after Optimization of College Students' IPE System

(1) Experimental methods

Two classes were selected from a university as the survey objects. It is known that these two classes are both ideological and political classes, and the overall level gap between students is not large. The two classes were named Class A and Class B, respectively, for six months of teaching. However, Class A adopted traditional teaching methods, while Class B combined new intelligent means based on digital education technology to carry out practical teaching. A comparative experiment was set up from three aspects: attendance rate, head rate and performance, and experimental data were recorded and analyzed.

(2) Data analysis

1) Attendance rate

According to the statistics, the attendance rate of the two classes has changed in the past six months, including 38 in Class A and 39 in Class B. The results are shown in Figure 2.
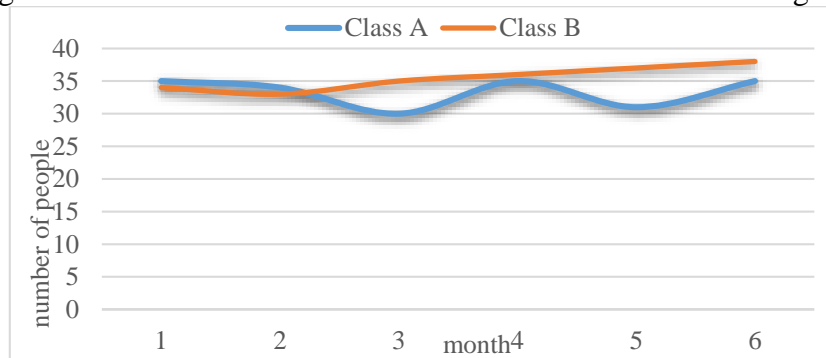

Figure 2 Comparison of attendance figures of two classes

As shown in the figure, the attendance of both classes was similar at the beginning of the first

month. However, due to unfamiliarity with intelligent digital education, Class B's attendance slightly declined initially. Afterward, it showed a steady upward trend. In contrast, Class A's attendance fluctuated and remained lower than that of Class B. Thus, intelligent digital education not only supports student growth but also enhances class development, strengthens collective cohesion, and helps cultivate high-quality, well-rounded talents.

2) Head up rate

The statistics of the change of the class head rate of the two classes are shown in Figure 3.
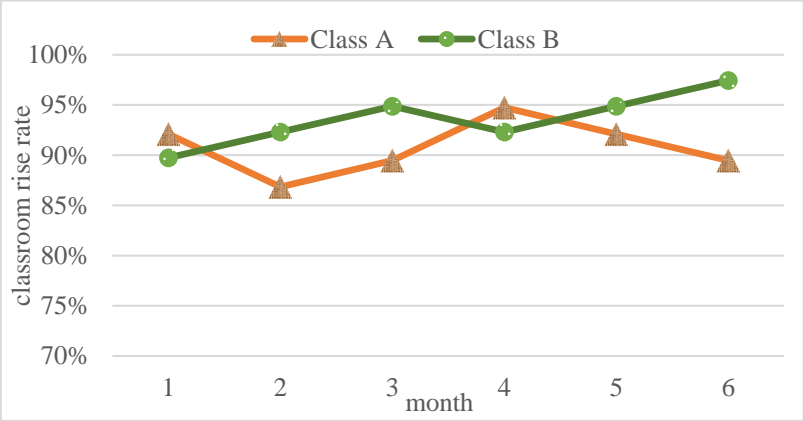
Figure 3 Comparison of classroom rise rate of two classes

As shown in the figure, the head-up rate of the two classes fluctuated slightly but remained above 85% throughout. Class B maintained a higher and more stable rate. This indicates that intelligent digital teaching enhances classroom effectiveness, while Class A's rate remained less improved, possibly due to issues in class management and teacher quality. To further raise students' awareness and motivation in digital classrooms, traditional teaching modes must be reformed to foster active classroom participation. Focus should also be placed on developing students' abilities in independent inquiry, cooperative communication, and critical thinking. Only then can students grasp the essence of digital classroom knowledge, stimulate learning interest, and support the realization of efficient mathematics teaching.
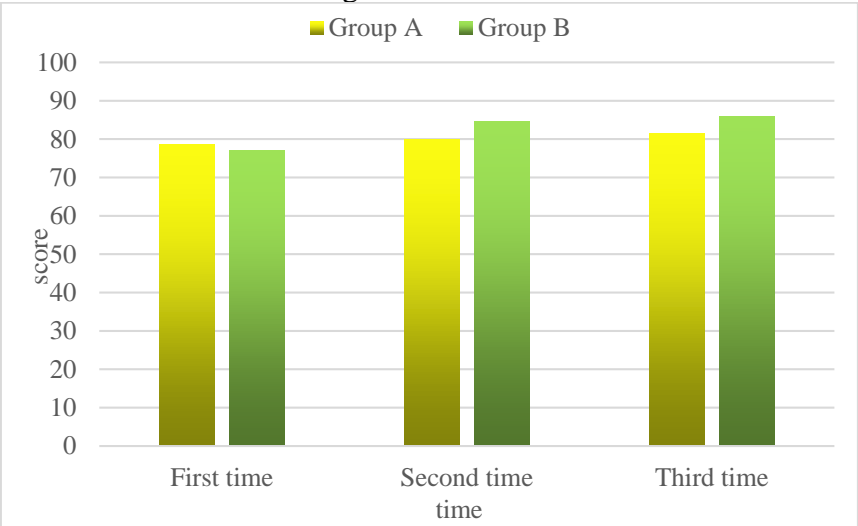

Figure 4 Comparison of test scores between the two classes

3) Achievements

The two classes took a comprehensive test every two months, with a full score of 100. Their average scores are shown in Figure 4.

In the first test, both classes performed similarly, with Class A scoring slightly higher. In the second test, Class B outperformed Class A, and in the third, both improved, but Class B remained consistently ahead. Overall, Class B's average score was about 82.5, while Class A's was around 80.03—approximately 3.08% lower.

Considering attendance, head-up rate, and performance, a comparative analysis was conducted. For consistency, the head-up rate was digitized and scaled by 100. Group A scored around 90.79, while Group B scored 93.59. The comparative results are presented in Figure 5.
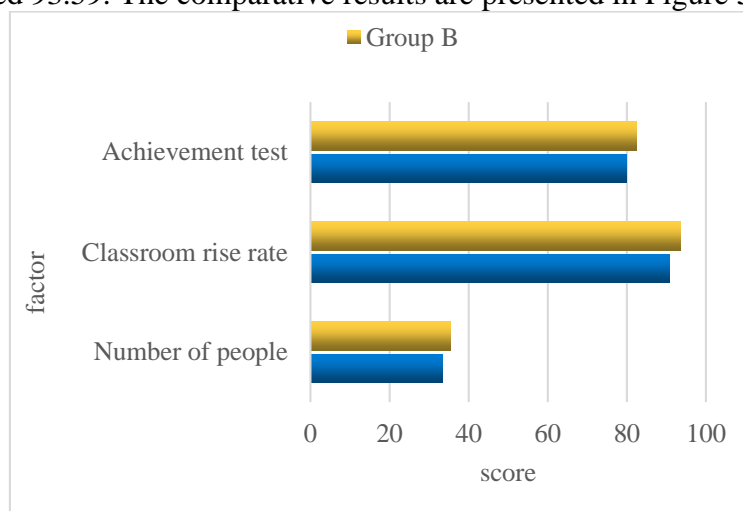

Figure 5 Comparison of the overall teaching effectiveness between the two classes

As shown in Figure 5, Class B outperformed Class A in attendance, head-up rate, and performance. However, after half a year of teaching and training, its advantages have not been fully realized, indicating a need for further improvement. Based on the analysis, intelligent digital teaching proves effective and meaningful for developing students' learning habits and abilities. It also enables full-process monitoring and timely support, helping students adjust learning methods and achieve better outcomes.

5. Conclusions

College students are successors in the new century, facing fierce social competition and unprecedented opportunities. IPE for them is both important and challenging, requiring practical measures. Digital education technology plays a key role in high-quality education. As part of IPE's innovation system, its rich digital resources are easily accepted by students, promoting information communication, knowledge sharing, and teacher-student interaction. This paper introduced the development of digital technology in education, analyzed its problems in IPE, and proposed an innovation system and development path combined with intelligent digital systems in higher education. Finally, it verified the feasibility of digital education technology for IPE reform through experiments, providing reference for researchers. Integrating intelligent education and scientific programming applies advanced computer technology to traditional teaching, helping students master skills early and apply knowledge flexibly, achieving twice the result with half the effort. It also improves students' thinking, enhances innovation, and stimulates their enthusiasm for scientific and technological exploration.

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