Analysis of virtual simulation training teaching problems of intellectual property law based on real working situations

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Song Shiyong

School of Political Science and Law, Qilu University of Technology (Shandong Academy of Sciences), Jinan, Shandong, China.
Email: songshiyong@qlu.edu.cn

ABSTRACT

This article aims to take AI intelligent training software and real business drills of intellectual property as the training mode to carry out intellectual property-related training in fields such as data intellectual property creation, application, management, transformation, and education, and truly achieve the educational goal of integrating science, education and industry. First, innovate the intellectual property training platform. Through AI question-and-answer led by digital human images, introduce front-line practical experts in the field of intellectual property into the virtual simulation training teaching process, build a training scene for the entire chain protection of intellectual property and real working situations, and improve the practical effect of training and cultivating intellectual property talents. Second, deepen the social service system of intellectual property. Project team members guide students and trainees to actively participate in patent navigation, patent group projects, pilot projects, intellectual property protection projects, etc., exercise and promote the continuous improvement of the social service capabilities of various intellectual property talents. At the end of the article, it is proposed that while intellectual property law teaching adapts to the development needs of the digital age, it should take the construction and teaching application of a virtual simulation experiment platform in real work situations as the core, respond to the practical needs of social practice work, and improve students' ability to adapt to society. The organic integration of AI technology, digital human technology and practical training teaching of intellectual property law has certain reference significance for the realization of the metaverse vision.

Keywords: *Intellectual property law, Metaverse, Practical training teaching, Real working environment, Teaching effectiveness, Virtual simulation.*

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Highlights of this paper

- Virtual simulation teaching is a basic teaching method in various fields of university teaching to exercise students' practical ability and promote the organic transformation of theory and practice ability, and it should be vigorously advocated in teaching.
- At present, the virtual simulation practical training teaching of intellectual property law, like the traditional virtual simulation teaching, does not have the early participation of front-line practical tutors, nor is it supported by real cases and actual processes. The teaching effect is mostly formalistic.
- The formation of AI courses and digital human avatars based on theoretical and practical tutors to participate in the construction of the metaverse model of intellectual property virtual simulation teaching can enable students to immerse themselves in autonomous learning 24 hours a day. This is the direction of virtual simulation practical teaching in the future.

1. INTRODUCTION

Technological advances, such as online courses and virtual simulations, are altering how we teach and learn (Peterson & Robertson, 2013). Due to the rapid development of modern computer simulation technology, more and more advanced and emerging teaching practices based on virtual simulation are constantly emerging (Wu et al., 2022). Virtual simulation teaching is a basic teaching method for exercising students' practical ability and promoting the organic transformation of theory and practice ability in various fields. While many reports espouse the potential impact that 3-D virtual worlds are expected to have on teaching and learning in higher education in a few years, there are few empirical studies that inform instructional design and learning assessment in virtual worlds (Jarmon, Traphagan, Mayrath, & Trivedi, 2009). Teachers' underlying conceptions become evident in their student-centered teaching methods and the application of problem-based learning (Keskitalo, 2011). Most of the time, teachers go through a trial-and-error approach in real classrooms to improve their skills in behavior management, resulting in teachers and students' having a negative learning experience, uncomfortable classroom climate, and strained interpersonal relationships (Delamarre et al., 2021). There is also a lack of assessment instruments to determine the impact of virtual simulation and virtual exchange on participants' self-realisation of learning in teacher education (Angelini, Muñiz, & Lozano, 2024). The vast majority of traditional virtual simulation teaching still conducts teaching activities on a truly "virtual" platform, without the early participation of teachers and the support of real cases and actual processes. Most of the teaching effects are merely formal. The virtual simulation practical training teaching of intellectual property law also has this problem. With the comprehensive penetration of AI technology into society, teaching has inevitably begun to organically integrate with AI(Artificial intelligence) technology and embarked on a new mileage of digital teaching. AI is a digital manifestation that simulates human thinking and behavior through computers. AI tools can be applied in the training process. AI-based training transforms organizations into knowledge-based organizations, which can meet the needs of individualized training and improve the quality of learning (Chen, 2023). Simulation technology provides a relevant method for teaching practical skills (Sanchez, Rueda, Kawasaki, Van Lysebetten, & Diaz, 2023). VR-based simulation can supplement and work as an alternative to the live classroom simulation to host participatory teaching development (Ke, Dai, Pachman, & Yuan, 2021). Using live websites to create engaging and comprehensive simulations that combine doctrines, theories, skills, and values in a way that cannot be achieved by the case method is a very good method of legal education (Nathenson, 2011). Professional legal education, like many aspects of our lives, is now under increasing pressure to enter the virtual spaces provided by digital technologies (Lee & Ferguson, 2015). Simulation, as a form of experiential and problem-based learning, enables students to integrate the 'classroom' experience with the real world experiences they will encounter in their professional lives (Strevens, Richard, & Edward, 2016). As virtual worlds continue to evolve into virtual communities with separate rules and expectations, it is important to understand the interaction between the laws of the real world and the laws of the virtual worlds (Lastowka & Dan,

2017). Virtual and augmented reality raise significant questions for law and policy (Barfield & Marc, 2018). Therefore, using the virtual simulation training teaching method can guide students to understand the similarities and differences between the real world and the virtual world.The simulation environment replicates reality, and technology-assisted simulation learning exercises for front-line judicial police officers in handling cases are crucial for realizing the transfer of learning (Davies, 2013). Intellectual property and technology clinics may play a greater role in clinical legal education and broader experiential learning (Dahl & Phillips, 2018). By strengthening industry links, tutors can build a portfolio of online practical activities that represent the 'real-life' industry, helping to forge long-term, collaborative partnerships to facilitate learners' acquisition of more meaningful knowledge and opportunities (Oliver & Oliver, 2022). Virtual reality environments show potential in many educational fields. In the interaction with virtual environments, personal immersive characteristics are a very important factor to consider (Ruggeroni, 2001). To further improve the teaching effect of intellectual property courses in colleges and universities, it is necessary to build an intellectual property course simulation experiment platform suitable for students' learning situations through independent construction (Lin, Guo, Ji, & Ran, 2023). A basic understanding of intellectual property (IP) is essential for practice as a professional engineer and/or designer to ensure commercial success. Engaging students in a 'real-life' scenario or problem is one of the most effective methods of doing this (Humphries-Smith & Adrian, 2012). The teaching of innovative methods requires a comprehensive, specific and in-depth understanding of how intellectual property rights play a role (Hennessey, 2007). However, AI technology cannot completely replace teachers' classroom teaching and reduce teachers to being assistants in the classroom. Teachers will always be the protagonists of the classroom. AI technology can only play the role and function of assisting and enhancing teaching effects.

In the process of virtual simulation practical training teaching in the field of intellectual property, it is necessary for the instructors to connect with the practical tutors in advance, understand the process of handling cases by front-line intellectual property practical experts, and use AI technology and the real case handling scenarios based on the practical tutors' handling cases in the front line to build the corresponding virtual simulation practical training teaching platform and lead students to study the practical training courses that closely combine theory and practice.

2. THE OVERALL GOAL OF INTELLECTUAL PROPERTY VIRTUAL SIMULATION PRACTICAL TRAINING TEACHING IN HIGHER EDUCATION INSTITUTIONS

2.1. Build an Intellectual Property Training Platform Under Real Working Situations

Build a knowledge graph of intellectual property courses, and integrate the real working environment and related processes of front-line practical experts through digital-intelligence models such as AI courses and digital human avatars into the intellectual property virtual simulation practical training platform for students' practice and training. Build a mode of deep integration of virtual reality similar to the metaverse to exercise and promote the organic integration of students' intellectual property theory and practical ability.

2.2. Carry Out in-Depth Intellectual Property Social Services

Led by theoretical and practical tutors, students are encouraged to attempt to transform intellectual property into real productive forces. Through presiding over and participating in related intellectual property projects, they aim to achieve different forms of social service achievements such as transforming scientific and technological achievements and intellectual property protection measures.

The specific manifestations are the following processes (see Figure 1):

Phase 1 - Intellectual property training platform: Front-line practical case handling experts provide real precedents - Theoretical tutors are responsible for constructing the metaverse working mode (AI courses + digital human avatars) ---- Theoretical and practical tutors participate in the training process with 24-hour online guidance ---- Students carry out training and learning anytime and anywhere --- Phase 2 - Provide intellectual property social services: Theoretical and practical tutors form teaching and research teams ---- Select outstanding students to join the team ---- Teachers and students jointly select teaching and research projects ---- Teachers and students jointly carry out teaching and research work ---- Achieve the goal of intellectual property social services ---- Feed back to teaching, research and practical case handling.

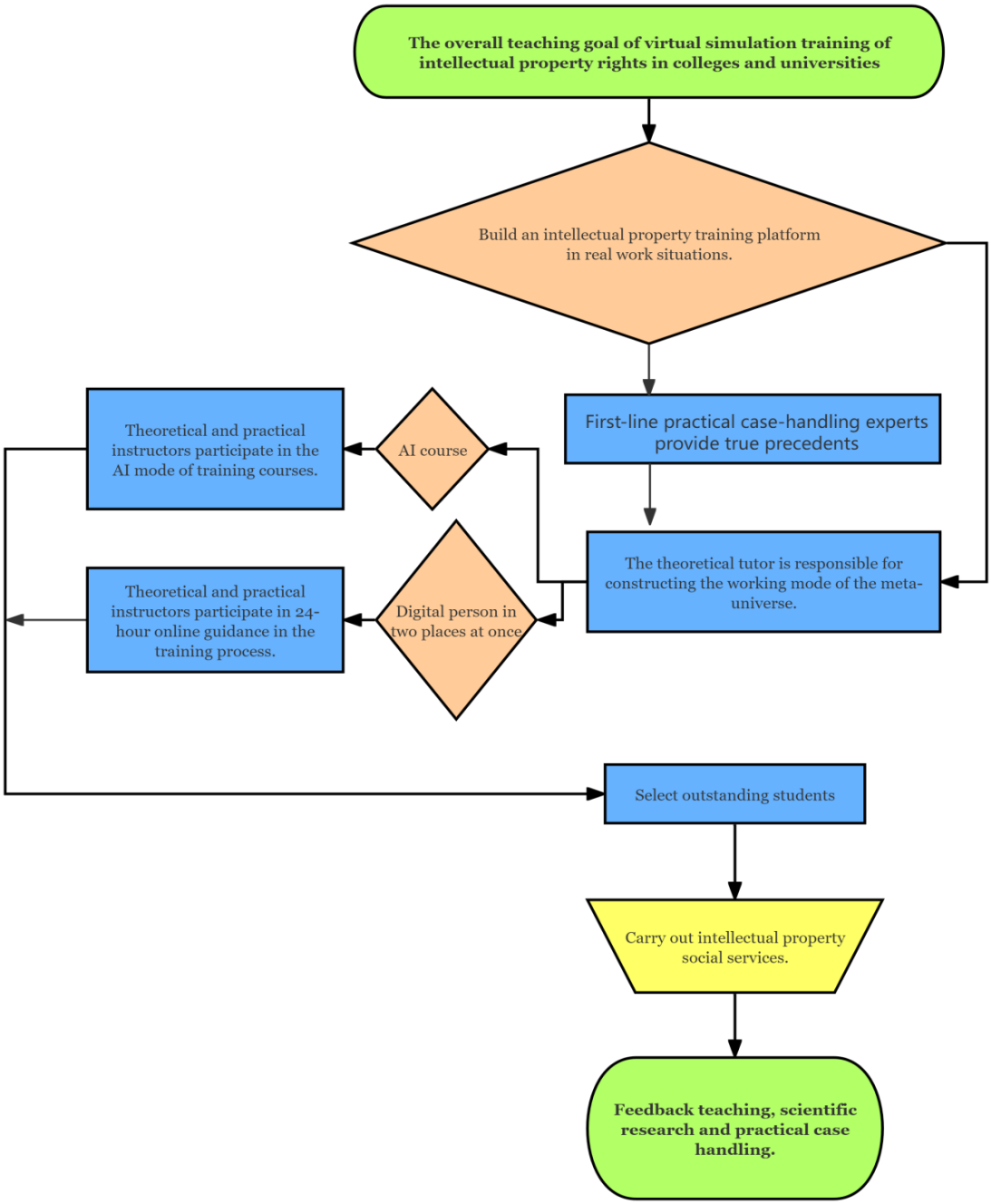

Figure 1. The main elements included in the overall goal of intellectual property virtual simulation practical training teaching.

3. THE MAIN TECHNICAL DIFFICULTIES AND PROBLEMS TO BE SOLVED IN INTELLECTUAL PROPERTY VIRTUAL SIMULATION PRACTICAL TRAINING TEACHING

3.1. Practical Teaching based on the Real Working Environment is Currently Rather Scarce

While strengthening the integration of intellectual property science, education, and production, how to effectively integrate it with the digital-intelligence reform and innovation brought about by the big data advantages of the school (institute), achieve the prescribed courses, credits and class hours stipulated by the Ministry of Education, how to carry out virtual simulation practical training activities for students' internships and practical training in real working situations, and construct the corresponding knowledge graph to improve students' practical and social service capabilities are issues that need to be focused on, and they are also the top technical difficulties. The digital-intelligence integration of intellectual property science, education and production has posed great challenges to the school's ability to connect social resources, the practical ability of university teachers, the interest of college students in internships and practical training, as well as the interest and extent of the real participation of all levels of intellectual property government affairs units, enterprises, and schools in society.

3.2. The Absence of Social Service Education in Higher Education in Colleges and Universities

The establishment of the digital-intelligence intellectual property college, led by the integration of science, education and production, is to achieve the comprehensive goal of integrating big data with theoretical teaching, scientific research, social services and cultural popularization of intellectual property. At present, the Ministry of Education has clear requirements for the proportion of class hours and credits for theoretical and practical courses in various majors such as law, with more emphasis on the learning of theoretical knowledge. The expansion of practical knowledge is only an aid to deepen the understanding of theoretical knowledge. The scientific research in colleges and universities focuses on theoretical research. Empirical research is not necessary and is only meaningful when carried out in combination with theoretical innovation. Social service is a new topic that colleges and universities have only begun to face in recent years. How to effectively carry out social services, and connect the achievements of theoretical teaching and research of intellectual property with intellectual property government affairs resources and industrialization resources and form effective service effects. Currently, colleges and universities are still in the initial exploration stage. It remains to be demonstrated whether they can truly exert initiative and effectiveness. The publicity and popularization of intellectual property culture is currently mainly carried out by relevant administrative authorities. Primary and secondary schools have demands in this regard, but lack motivation and guarantee mechanisms.

4. TECHNICAL SCHEMES AND EMPIRICAL METHODS OF VIRTUAL SIMULATION PRACTICAL TRAINING TEACHING OF INTELLECTUAL PROPERTY

Generative artificial intelligence tools have great potential in education. They offer innovative ways to engage students, adapt content and promote personalized learning. By embracing these technological advancements, education can remain relevant and effectively address the challenges of the digital world (Ruiz-Rojas, Acosta-Vargas, De-Moreta-Llovet, & Gonzalez-Rodriguez, 2023). The digital-intelligence integration college of intellectual property science, education and production should make full use of AI technology, and set specific teaching tasks with universities, research institutes, enterprises and social audiences as the main body.

4.1. Universities are the Key Subjects in the Construction of Virtual Simulation Practical Training Teaching of Intellectual Property, and are the Decisive Force Determining the Effectiveness of Intellectual Property Teaching

Virtual simulation practical training teaching based on real situations is a complex project. Universities need to set the teaching nodes and teaching goals of virtual simulation teaching according to the actual needs of teaching and the available space for its role. They also need to coordinate and incorporate various front-line practical experts who are truly capable and accomplished, and overall plan and lead the construction and optimization of the virtual simulation practical training teaching platform.

4.2. Big Data and Intellectual Property Research Institutes are the Innovative Subjects in the Construction of the Virtual Simulation Practical Training Teaching Platform

The virtual simulation practical training teaching platform attracts front-line practical experts in big data and intellectual property throughout their life cycle to integrate into the process of cultivating digital-intelligence intellectual property talents, conducting scientific research, platform construction, industrialization services and development. It collects the image data of experts, uses AI technology to build digital humans, and creates a virtual simulation practical training platform similar to the metaverse for them. The application of the metaverse and related technologies in the field of education is out of the need to address a series of challenges that emerged during the Fifth Industrial Revolution and the COVID-19 pandemic (Latino, De Lorenzi, Arcuti, & Corallo, 2024). At present, provinces and cities in China have included the metaverse in their development plans, and have vigorously promoted it and given policy preference and support, including education. Therefore, theoretical and practical tutors working together to create a virtual simulation internship and training platform based on the real working environment, and building a teaching environment similar to the metaverse to teach and promote intellectual property theory and practical knowledge will help achieve the development goals of digital-intelligence intellectual property education, teaching and social services.

4.3. Intellectual Property Enterprises and Other Social Audience Groups are the Traditional Subjects in the Construction of the Virtual Simulation Practical Training Teaching Platform

As the main teaching body of universities, other enterprises often only nominally participate and cannot truly achieve the goal of cooperative education. Other social audience groups, such as primary and secondary schools, have traditionally been basically unable to participate. The virtual simulation practical training teaching platform optimizes and integrates them. In the form of appointing key practical tutors and typical representative experts with outstanding contributions in the field of intellectual property to truly participate in the entire process of talent cultivation, it finds out the pain points, difficulties and contribution points in the cooperation process of each unit. While carrying out practical teaching of intellectual property, it conducts regular publicity of intellectual property to students and society to realize the true meaning of the integration of digital-intelligence intellectual property science, education and production.

4.4. Improve the Empirical Methods of Virtual Simulation Practical Training Teaching of Intellectual Property

The virtual simulation practical training teaching of intellectual property rights studied in this article is different from the virtual simulation software used in previous classes. It is a virtual simulation teaching based on real working situations.

This virtual simulation teaching model breaks through the traditional drawbacks of previous virtual simulation teaching: the lack of real teaching cases, the lack of teaching participation from front-line case handlers of

intellectual property rights, and the lack of practical links for students and teachers to enter society to carry out social services of intellectual property rights.

The virtual simulation practical training teaching of intellectual property rights studied in this article is an organic integration of the knowledge resources and human resources accumulated by the author based on years of teaching and scientific research practice. The following empirical research methods are mainly adopted:

Teachers actively carry out the classroom reproduction method of real cases. During the long-term teaching and scientific research process, the author has accumulated a large number of real and typical intellectual property judgments, and has formed relevant research reports and works, which can be used as practical training materials for classroom teaching. Through interactive communication with students in the classroom, the legal deficiencies in the cases are discovered, further guiding students to consult literature and deepen the cognition of relevant knowledge points. At the same time, teachers can also discover new research perspectives for scientific research and teaching research from it, which can help teaching and scientific research work.

Teachers attempt to guide practical experts to change lectures into daily teaching methods. In traditional teaching methods, the focus of practical teaching is that practical experts enter the classroom to give lectures and students listen. However, long-term teaching practice shows that occasional expert lectures can expand students' knowledge, but they are not very helpful for systematically cultivating students' practical thinking. Because practical experts have not established a regular emotional connection with students and teachers, cannot fully integrate into the teaching process, do not understand the main methods and key points of teaching, nor do they know how to better present their practical knowledge to students in the daily teaching process. They just present their case-handling process to students blindly. Such lecture effects cannot bring substantive help to students' learning. Therefore, the author attempts to form a teaching team with front-line case-handling experts of intellectual property rights and the teachers, enabling them to enter the classroom for teaching regularly. This allows practical experts to better understand the teaching process and key points, and also enables students to establish a better relationship with practical experts for more in-depth learning and better learning effects.

The combination of theory and practice experts jointly leads outstanding students to provide social services in the form of projects. In the past teaching process, scientific research and teaching were independent of each other. But in the new situation, colleges and universities are increasingly emphasizing the integrated development of teaching, scientific research and social services. Teachers who merely focus on teaching are no longer encouraged in various colleges and universities. Being able to conduct good scientific research, achieve the organic combination of teaching and scientific research, and be able to provide social services based on teaching and scientific research is what colleges and universities focus on promoting and need. During the daily teaching and scientific research process, the author has established a very good cooperative relationship with practical experts in the fields of intellectual property administrative management, legislation and judiciary, and has a good emotional foundation. Through jointly participating in teaching and scientific research activities, both sides have a deeper understanding of each other. As a teacher, the author will select outstanding undergraduate and graduate students in the daily teaching and scientific research process, lead them together with practical experts, select appropriate intellectual property projects, and do the corresponding social service work. This work further feeds back to teaching and scientific research, enhances the theoretical and practical ability of the author and other teachers, also provides good exercise for students, and provides a good theoretical learning opportunity for practical experts, achieving a win-win situation.

5. MAIN MEASURES OF VIRTUAL SIMULATION PRACTICAL TRAINING TEACHING OF INTELLECTUAL PROPERTY

5.1. Connect With Industrial Resources and Strengthen the Teaching Team in the Aspect of Intellectual Property Protection

Actively integrate with the resident intellectual property operation and protection center, law firms, intellectual property agency companies, and other intellectual property-related enterprises, etc. Conduct practical research on practical needs and effectively transform them into the teaching and research content of intellectual property. According to the teaching plan agreed upon by both parties, intellectual property-related enterprises appoint key industrial tutors to participate in the entire chain of student cultivation process, give full play to the enterprise resource advantages to allow students to understand the application scenarios of their professional knowledge in advance, and the enterprises are responsible for the cultivation of students' professional skills. To successfully achieve this goal, actively promote the teaching model of "customized professional course instruction + practical training and internship", pilot the selection of undergraduate students' academic year papers and graduation theses based on enterprise issues, and have enterprises and schools (colleges) jointly guide students to complete graduation designs or theses, and implement the dual-tutor responsibility system.

5.2. Build a Knowledge Graph of Big Data and Intellectual Property and a Virtual Simulation Internship and Training Platform

The emergence of generative artificial intelligence (AI) technologies, such as large language models (LLMs) like ChatGPT, a large language model for daily communication, has triggered a paradigm shift in the fields of academic writing, plagiarism, and intellectual property (Hutson, 2024). However, the organic integration of AI technology and intellectual property in the teaching field is still worth exploring. Build a knowledge graph of characteristic courses of intellectual property rights focusing on the seven main objects of intellectual property rights, namely patents, trademarks, copyrights, trade secrets, geographical indications, layout designs of integrated circuits, and new plant varieties.

Different from the "virtual" nature of the traditional virtual simulation experiment platform, relying on the outstanding front-line intellectual property key practical experts of the cooperative units, we explore the construction of a virtual simulation internship and training platform for intellectual property based on the real working situation. The training scope can be piloted around the entire field of intellectual property or a single field. By collecting the image data of the front-line practical experts and using AI technology to build the corresponding digital humans, and incorporate them into the knowledge graph for teaching display and training. It can better guide students.

5.3. The Schools, the Government and Enterprises Make Joint Efforts to Promote the Conscious Cultivation of Intellectual Property Culture

The metaverse and its various Web 3.0 subdomains represent a breakthrough expansion of the physical and digital worlds. In this emerging landscape, the real and virtual worlds are being integrated in a way that promotes interaction and creates immersive experiences. This transformation has significant implications for various fields, especially in reshaping online and traditional educational approaches (Fan, Yecies, Zhou, & Shen, 2024). Intellectual property rights have played an increasingly important role in various fields, but the intellectual property culture still has not formed the due atmosphere in China. The construction of a virtual simulation video platform based on real working situations forms a virtual reality immersive environment similar to the metaverse, which plays an important role in promoting the intellectual property culture.

Introduce advanced figures and typical deeds in the management, operation, protection and industrial development of big data and intellectual property rights in the local area. Take local primary and secondary schools and universities as pilot groups for student beneficiaries, and jointly carry out publicity and popularization of relevant knowledge with practical units and experts related to intellectual property rights to enhance the practical ability of teachers and the cultural awareness and protection consciousness of intellectual property rights among college students and middle school students (radiating to primary school students in due course). At the same time, give full play to their leading role, form a good atmosphere for the operation and protection of intellectual property rights around them, promote the conscious formation of intellectual property culture, and promote the progress and development of regional intellectual property civilization.

6. CONCLUSION

In conclusion, on the basis of optimizing the traditional talent training program for intellectual property rights, summarize the weaknesses of "true virtuality" and "false practicality" of traditional virtual simulation teaching software, integrate front-line experts in the entire chain of digital and intelligent intellectual property rights, and build virtual simulation practice and training software for intellectual property rights based on real working situations. During this process, apply AI technology, digital human technology, etc., for practical teaching and talent training in intellectual property law, contribute to the integrated development of intellectual property science, education and industry and the construction of strong cities and provinces with digital and intelligent intellectual property rights, and lead the development of digital and intelligent intellectual property education.

Meanwhile, relying on the professional characteristics of intellectual property law, double-degree talent training is carried out to attract students majoring in science and engineering to minor in law, promoting the in-depth integration of intellectual property and other disciplines. Cooperating with intellectual property social service institutions and jointly conducting intellectual property social talent training activities. With the offering of characteristic intellectual property courses such as integrated circuit layout design and geographical indications, and on-site visits and knowledge training of the digital system of the geographical indication building, on the one hand, application-oriented, compound and innovative intellectual property talents who understand both intellectual property and digital knowledge are cultivated. At the same time, it has played a very good leading and exemplary role in the formation of the local intellectual property cultural atmosphere.

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