An Analysis of the Integration Path of Intellectual Property Education and Innovative Talent Cultivation

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Abstract: *In recent years, both the teaching of intellectual property and the cultivation of innovative talents have gained the attention of all levels of higher education. The normative system of intellectual property rights has changed people's ideas about innovation; legal boundaries have been set, awareness of exclusive rights has motivated all sorts of ways of thinking, and the mechanism of disclosure for protection under the logic of intellectual property rights is intrinsically linked to the emergence of groundbreaking ideas. According to intellectual property literacy, the hierarchy of innovation ability starts with a basic knowledge of rights, is followed by the ability to avoid innovation, then problem discovery and resolution through information analysis, and finally reaches the integration of layout thinking. Integrate the two knowledge systems in cross-disciplinary design of modular teaching and innovative teaching methods in the integrated curriculum architecture, promote training in reverse engineering and rights avoidance, and build a synergistic mechanism of lifecycle management and project incubation. The above analysis offers the theoretical foundation for the study of intellectual property education and innovation.*

Keywords: *Intellectual Property Education, Cultivation of Innovative Talents, Cognitive Framework, Curriculum Architecture, Integration Path.*

Introduction

The foundation of cultivating innovative talents is to build an educational system that can actively promote original thinking, and intellectual property education is particularly special in this regard because it has its own rule system and rights logic. Although the first direction of innovation education has promoted the development of divergent thinking and problem-solving abilities, it has paid less attention to the structural guiding role of legal constraints on creative works. The normative boundaries, exclusivity consciousness and protection logic of intellectual property education are precisely what are lacking here. Therefore, the students will be able to place their innovations more precisely according to the rules. The purpose of this paper is to show the basic link between intellectual property education and the cultivation of innovation, and it does not claim that one promotes the other. This is because the two types of knowledge in the current education system are in different states, and thus learners either achieve unprotected results due to a lack of rights awareness or fail to innovate because they are too cautious. Based on the all-round study of the three levels of cognitive motivation, ability grades and the structure of the curriculum, this paper will provide theoretical support for the integration path.

1. The Intrinsic Drive of the Intellectual Property Cognitive Framework and Innovative Thinking

1.1 The Normative System of Intellectual Property and the Boundary Reconstruction of Innovation Cognition

The rules of the intellectual property system have set legal limits on the development of new technologies and specified who can exercise the rights to use them and when. It is not to limit creativity, but rather a way to organise the thinking process of innovation. This guide will help people learn about their current rights and any other places for new ideas before they begin creating. According to the rules of novelty, inventive step and applicability, the criteria for determining inventiveness will be known. Students have learned to interpret patent claims and can now judge the distinctiveness of trademarks and set boundaries for fair use in copyright; at this time, their thinking is no longer free

exploration but constrained problem-solving. Thus, they will be able to incorporate the new ideas into the rules and regulations more reasonably.

One serious consequence of boundary reconstruction is that the recognition ability for "blank areas" has improved. The norms of intellectual property have set out the scope of protection, and at the same time, have also shown indirectly the areas that are not covered or weakly protected; these places are often rich in new ideas. Organise the teaching of skills for rights search, assessment of the rights situation and analysis of infringement risks systematically in class, and students will begin to see the normative system as a way to help them live freely rather than a restriction. After several rounds of training, defects and redundancies have been found in the current network of known rights; therefore, the innovative cognition has changed from indefinite "infinite possibilities" to determinate "optimal solutions under limited conditions", and this change in cognition is a necessary condition for the cultivation of innovative talents[1].

1.2 The Mechanism for the Awareness of Exclusive Rights in Promoting Differentiated Thinking Paths

At the foundation of the awareness of exclusive rights is the idea that creative works have extraordinary value; therefore, people are motivated to actively pursue all kinds of forms or technical solutions that differ from what has been achieved so far. Therefore, the students are no longer content with merely repeating or imitating the existing knowledge; instead, they are aware of the new way that has been taken and consciously avoid it. Intellectual Property education can present the territoriality, temporality and exclusivity of patent rights systematically to help students develop the idea of "circumventing existing right claims". Therefore, they will be eager to find existing solutions in the conceptual stage, analyse the technical features and expressive qualities of these solutions, and then design new ones that are significantly different in function, structure or form of expression.

At the level of cognition, consciousness of exclusive rights gives rise to two kinds of thought: analogical transfer and reverse reasoning. Analogical transfer is a way for learners to apply the rule of exclusivity for rights in one area to another and thus create new cross-domain combinations. Reverse reasoning is used to find a good way for innovation under the condition of "not infringing on the rights of others", and in conjunction with this method, a rule-based, systematic and non-random type of differentiated thinking can be achieved. Awareness of exclusive rights can help learners better recognise the potential value of their own achievements, motivate them to explore the possibility of obtaining rights during the innovation process, and thus form an "innovation-protection" feedback loop; this loop is one of the characteristics of innovative talents compared with those based on general knowledge.

1.3 Correlation Model between the Logic of Intellectual Property Protection and the Generation of Breakthrough Thinking

The foundation of the logic for intellectual property protection is "disclosure in exchange for protection", so in order to be granted exclusive rights, the rights applicant must provide full disclosure of the technical solution or work. First of all, it will be the source of new ideas. When learners are learning about the drafting of patent specifications, the layout of patent claims and the choice between trade secrets and patents, they need to repeatedly consider what to disclose, how to disclose it and to what extent to disclose it. Weighting is employed to organise the release of information. It can help the students find the main points of a good new product, present these features in an all-encompassing way, and still be specific enough for engineers to use. The function is cognitively isomorphic with the extraction and reconstruction of the main problem in breakthrough thinking[2].

The Construction of the correlation model can be summarised as: "constraint-induced abstraction produces cross-domain connections". Intellectual property protection requires that innovators create an official form for their results in the legal system; thus, they do not need to consider particular circumstances and can focus on the generality of functions and separability of structure. Students have been asked repeatedly to "generalise a special solution into a set of rights claims", so they are beginning to think in terms of general rules rather than particular cases. Breakthrough thinking often results from the unexpected combination of different areas of knowledge, and abstract concepts are more likely to cross domain boundaries and be newly combined. Tools and Expression Models for the Logic of Intellectual Property Protection give learners the freedom to arrange conceptual elements within the bounds of the law and create new, original and protectable works. The cognitive framework

above contains the constraints and motivations for innovation and provides a theoretical basis for IP education in the cultivation of innovative talents.

2. The Hierarchical Structure of Innovation Capability Based on Intellectual Property Literacy

2.1 The Transition Path from Cognition of Basic Rights to Innovation Avoidance Ability

Cognition of basic rights is the lowest level of intellectual property literacy. First of all, there are general ideas, authorisation conditions and scopes of protection for patents, trademarks, copyrights and trade secrets. At this time, students have learned about the structure of patent claims, the requirements for newness and inventiveness, and some ways to find infringements. What is formed at this stage of cognition is not a fixed knowledge base but an initial filter to screen and evaluate one's own direction of innovation. When learners can recognise that a particular technical solution falls within the scope of another person's patent claims, their cognitive activities will change from simple memorisation of rules to the application of those rules, and the starting point of this change is shown here.

The goal of the modification is not to present new ideas but to organise the development of options outside the scope of rights. The two links in the construction of this ability are the decomposition of claim elements and functional equivalence mapping. First, break down the technical features of the target patent claims into some necessary parts, and then, one by one, find functional equivalents for each feature and build a new solution that can achieve the same or a similar technical effect without infringing on the original claims. In terms of cognition, it is not an addition but an organisation of the learner's cognitive system; that is to say, the focus moves from "What are the rules?" to "How can I get around these rules?", and from passively accepting norms to actively exploiting loopholes and defects in those norms. Therefore, more people will be aware of the rules of intellectual property in their daily lives and will not infringe upon them unintentionally.

2.2 Problem Discovery and Solution Strategies Based on Analysis of Intellectual Property Information

The subjects of the intellectual property information analysis are patent documents, trademark registration data and copyright registration records, and various methods have been employed, such as technical classification, citation network analysis and rights status mapping, to reveal the distribution and development of technology in a particular area. At the same time, the students will be able to construct a map of the domain knowledge themselves and identify areas that have been covered well and technical deficiencies. In fact, the identification of blank areas is a kind of problem-finding process; that is to say, either the existing solutions have not effectively addressed this particular technical problem, or they have defects that need to be avoided, and these problems often provide the real starting points for new ideas. Organised data on intellectual property are used to organise the problems that need to be solved[3].

At the level of problem-solving strategies, the two main ways to use intellectual property information for problem-solving are the recombination of technical elements and the search for functional substitutes. Recombination of technical elements is to collect many different technical features from various patent documents and, based on the functional or structural similarity of these documents, form a new technical hypothesis. Search for functional substitutes is based on whether the patent classification code or keywords are relevant; that is to say, one needs to find a different physical mechanism or material solution that can achieve the same function and avoid the claim limitations of existing patents. Based on the analysis results above, both strategies should be presented in terms of problems and solutions. That is to say, after some training in reading patent claims and descriptions, learners will gradually develop the cognitive pattern that "a certain type of technical problem can be solved in many ways". Based on the above, we can quickly find the corresponding patent information in case of a new technical problem, develop a solution plan in light of the existing intellectual property, and thus reduce the time cycle for problem identification and resolution to the absolute minimum.

2.3 The Embedding Approach of Intellectual Property Layout Thinking in Creative Activities

Intellectual Property Layout Thinking does not refer to the protection claim of a single result; rather, it is about the world allocation strategy for rights in a particular technical field or product series. The three kinds of thinking are to build a network of claims, to organise the core and peripheral patents in a

hierarchy, and to jointly design the territorial and temporal scope. Embedding layout thinking in creative activities means that, at the stage of generating an initial idea, one starts to consider the position of that idea in the future development of technology, forecasts which directions may yield patentable solutions, and adjusts the direction of innovation according to defensive or offensive layout goals. Therefore, in anticipation of new developments, some people have begun to exercise their rights proactively.

The three stages of operation for the embedding approach are as follows: In the conceptual stage, learners will observe the existing patent map, find blank spaces in the layout, and take these as the starting points for innovation; in the solution design stage, based on the same core technology, many branches of solutions will be developed and variations in the scope of protection will be made to form potential families of claims; finally, at the outcome evaluation stage, learners will compare their own solutions with those in competitors' layouts to decide whether to add peripheral patents or adjust the technical path. The above operations will organise the arrangement of intellectual property at the Design stage, not after the fact. Layout thinking is employed in the creation process, and every new idea produced by a student is also an exercise in asserting one's own rights. Not only are they a single technical solution, but they are also a set of rights with strategic value. The first is the integration of legal thinking and technology; the second is the cultivation of innovative talent under the leadership of intellectual property literacy.

3. Integrated Curriculum Architecture of Intellectual Property Education and Innovation Cultivation

3.1 The Cross-Disciplinary Design of Modular Intellectual Property Teaching and Innovation Methodologies

Modular teaching divides the knowledge system of intellectual property into several relatively independent modules, such as claim analysis, infringement determination, search strategies and layout planning, etc., and each module is associated with a particular cognitive operation skill. New Ways of Solving Problems include brainstorming, morphological analysis, TRIZ theory and Design Thinking, etc. The joint Design of the two is not random; rather, an organised system of units and methods has been established in the curriculum to ensure that every module of intellectual property can be connected with an appropriate set of innovation tools. Organisation of the Claim Analysis Module is divided according to the division of responsibilities. When learners break down the technical attributes of an independent claim, they can also use the function-means analysis method to organise their understanding of legal language systematically for the analysis of technical problems[4].

Firstly, the Aim of Cross-disciplinary Design is to establish a teaching closed-loop system with feedback. On the one hand, the rules of intellectual property restrict the form of innovation, so many ways of thinking may not be patentable. At the same time, new ways can be employed to create new intellectual property knowledge, and thus the rules of rights knowledge can be learned better through practical experience. A composite task unit can be added to the curriculum structure, and in a short time, learners need to complete the whole process of patent searching, blank spot identification, solution generation and drafting a claim set. At the same time, the intellectual property module and the innovation method module are taken in turn to form a cycle of "rule constraint - divergent generation - rule verification - convergent optimisation". Therefore, the cross-disciplinary Design should integrate the two kinds of knowledge systems at the cognitive level organically and not place them side by side.

3.2 The Innovation-Catalyzing Function of Reverse Engineering and Rights Avoidance Training

Training in reverse engineering takes existing patented products or technical solutions as the object of study; that is to say, learners need to deduce the design ideas, technical paths and range of claim protection by reverse deduction. Do not copy it; instead, one should be taught to work backwards from the result to discover why. When learners cannot connect the claims and the specifications, they need to determine the purpose of each technical characteristic, how essential it is to the whole solution, and then decide which parts are covered by exclusive rights and which fall under the public domain. The purpose of reverse engineering is to show the basic technical structure that results from new technologies in a way that is easy for people to learn and understand how these technologies work.

Based on the above, right-of-way avoidance training will be introduced to teach students how to avoid a certain situation and what other reasonable choices are available. The general direction of this

training is to "preserve the function and change the path", that is, to keep the original function of the target result the same and modify the technical means or structural combinations used to achieve that function. Avoidance training has helped the students learn to recognise problems, find relevant features in the course, integrate related technologies, check for risks and generate new ideas repeatedly. A new type of innovation is driven by the combination of reverse engineering and rights avoidance training; that is to say, in order to avoid the old rights, one must break free from the technical inertia of the past and find a new way. The newness and practicality of such creative works under constraints are highly in line with patent innovations in real situations, so the training itself has the function of innovation incubation.

3.3 The Synergistic Mechanism of Intellectual Property Lifecycle Management and Innovation Project Incubation

The life cycle of intellectual property includes the stages of creation, use, protection, exploitation and disposal; at any given time, the corresponding rights and economic benefits will be different. In the development of the curriculum for life-cycle management, in addition to their innovation projects, students will also need to create a timeline management plan for intellectual property. At the start of the incubation period for this project, we need to decide which of the intermediate results will be considered trade secrets, which ones need to be disclosed promptly for patent applications, and whether a defensive disclosure method will be employed to prevent competitors from copying the layout. Therefore, by organising these innovation projects in advance, they will be carried out simultaneously, and the speed at which we obtain intellectual property rights will be in line with the technological level of the project.

The reason for this synergy is that it is a feedback loop; that is to say, management decisions at any time in the life cycle will affect the adjustment of the direction of the innovation project. An office action issued during the patent examination may disclose new information about the prior art, and thus the project team will need to revise the technical solution or redefine the inventive step. Considering the economy of maintenance fees, only the essential parts and important places in the project will be covered. The market will inform us of the patent licence or transfer for the next innovation. A simulated project can be added to the curriculum architecture, and learners need to complete all the links in the process, such as generating an idea, searching for and analysing it, preparing application documents, answering examination questions, exercising rights operations, etc., for a particular technical concept. At this time, the life cycle of intellectual property will no longer be considered an external legal process for innovation; rather, it will be integrated into the structure of the innovation project, and over time, the synergy between the two will form the foundation for operating the integrated curriculum architecture.

Conclusion

The integration path of intellectual property education and the cultivation of innovative talents can be based on the three levels of cognition, ability and curriculum. At the level of cognition, the normative system of intellectual property can promote innovation by changing from free exploration to bounded, specific problem-solving based on boundary construction, and it can also foster a sense of exclusivity and internalise the logic of protection. In terms of ability, students can go from knowing the basic rights to being able to avoid the infringement of innovation, find problems and solutions by analysing information, and apply layout thinking in all their creative works. At the level of curriculum design, there will be cross-disciplinary design of modular teaching and innovative teaching methods; training in reverse engineering and rights avoidance; and the synergistic mechanism of lifecycle management and project incubation will be the three support pillars of the integrated curriculum architecture. In the future, we will continue to build an index system of integration effects, explore all ways to adjust integration in light of the specific circumstances of different subjects, and study the application of digital teaching tools in reverse-engineering simulation and life-cycle management training.

References

[1] Zhao Lan. Exploration of Intellectual Property Popularization Education from the Perspective of Innovation and Entrepreneurship Talent Cultivation. Journal of Hubei Open Vocational College

38.22(2025): 12-13+16.
[2] Pan Jia. Research on the Path of Deeply Integrating Innovation and Entrepreneurship Education into the Cultivation of Intellectual Property Professionals. Higher Education Forum .02(2025): 105-109+124.
[3] Zhang Junrong, and Zhang Zhaohe. Research on the Cultivation Model of Interdisciplinary Undergraduate Intellectual Property Talents in China. Heilongjiang Education (Higher Education Research and Evaluation) .06(2024): 49-52.
[4] Zhao Wei. Intellectual Property Education Promotes the Cultivation of Innovation and Entrepreneurship Talents in Application-Oriented Universities. Industry and Technology Forum 20.06(2021): 163-164.