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Intellectual property regulations in school textbooks and curriculum

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Abstract- Intellectual property (IP), as an intangible asset, plays a pivotal role in national development and economic growth worldwide through new ideas, inventions, patents, innovations, and advanced technologies. Developing creative thinking skills in children and future inventors from an early age with IP knowledge is crucial, as creativity and innovation are the main driving forces of global economic progress. Many countries, including Finland, Singapore, and South Korea, are integrating IP education into their school systems through collaboration with professional organizations. However, textbook-level empirical analysis of IP education is lacking in Mongolia. Therefore, this study aims to analyze how IP concepts are reflected in Mongolian general secondary school textbooks and identify opportunities for improvement. Using content analysis, 147 textbooks from grades 1-12 on the econtent.edu.mn website were examined through keyword searches. The results showed that IP-related teaching hours increased from 0.15% in 2021 to 0.45% in 2025. However, despite this relative increase, the overall proportion remains insufficient for systematically fostering IP awareness. The content remains fragmented and insufficient for comprehensive understanding. This study suggests that incorporating IP education into curriculum and textbooks may potentially contribute to developing students into creative, ethical, and innovative citizens.

Keywords: Intellectual property education, General secondary education, Content analysis, Creativity and innovation

1.INTRODUCTION

In recent years, the value of intellectual creations has been increasingly recognized worldwide. Governments have sought to create environments that effectively support intellectual creations and enable intangible outcomes of human creativity to enter economic circulation. Through collaboration with relevant institutions and individuals and the implementation of well-researched policies, such efforts may contribute to national development and economic strengthening. The Mongolian Constitution stipulates that intellectual works, scientific and cultural heritage are protected by the state, and recognizes intellectual property created by citizens as the property of the author and as national wealth [1]. It also guarantees that citizens have the right to create cultural, artistic and scientific works, to benefit from their results, and to have their copyright protected by law [2],[3]. The Intellectual Property Law of Mongolia defines "Intellectual property" as "industrial

property, copyrighted works, and works of copyright that are the result of the inventor." [4].

The World Intellectual Property Organization (WIPO), established in 1967, brings together 193 countries around the world with the aim of protecting, regulating, and developing intellectual property rights at the international level. Mongolia signed an agreement to join in 1979 [5], creating an opportunity to jointly develop intellectual property with the rest of the world. The Convention Establishing the World Intellectual Property Organization defines intellectual property as: literary, artistic and scientific works, performances, sound recordings, radio and television broadcasts, all innovative human creations, scientific discoveries, industrial designs, trademarks, service marks, names and expressions of legal persons, protection against unfair competition and all other rights resulting from intellectual production in the industrial, scientific, literary and artistic fields [6].

The World Intellectual Property Organization states that "Intellectual property is a natural ability that is inherent to all human beings and is a factor that advances social development throughout history, linked to all cultural practices." [7].

Scientific and technological progress and intellectual creation in key industrial sectors play a decisive role in the economic growth of countries around the world. Education, associated with the growing demand and need for new inventions and new technologies, is quickly becoming a vital sector that will determine the direction of cultural development. Most countries have seen significant economic growth because of innovation. It is becoming increasingly clear that countries with an environment that enables innovation will succeed in the global competition [8]. Scientific and technological development is a catalyst for national development. Countries that spend a certain percentage of their gross domestic product on science and technology grow their economies, create jobs, and increase competitiveness through inventions, innovations and patents [9].

The WIPO Academy has defined intellectual property education as a training and skills development activity that empowers people and fosters innovation and creativity [10]. The main goal of this organization is to foster a culture of creativity and innovation through intellectual property education [11]. In other words, Intellectual Property Education is defined as the process of providing students, teachers, and young inventors with the knowledge and skills to generate new ideas, create new inventions, and have those inventions evaluated and protected. This is not just about legal provisions, but also about developing creative thinking and understanding how creative ideas themselves can be valuable [12].

Intellectual property education is defined as the process of teaching students, teachers, and young people the knowledge and skills to think creatively, protect their work, and respect the intellectual work of others. Exploring the possibility of introducing intellectual property education at the general secondary education level in Mongolia may contribute to the development of innovative, ethical, and creative citizens of the future.

The transformation of the global education system follows the needs of society. Each country, based on its own characteristics and development, has the main goal of improving the academic performance of students, increasing their level of education, and providing them with opportunities for future success. As shown by the successful implementation of educational reforms, countries are striving to change their traditional educational practices and adopt innovative methodologies and policies [13]. This enhances the creative thinking and problem-solving skills of every child, while increasing their chances of achieving success in the future [14].

Therefore, this study aims to systematically analyze how intellectual property concepts are reflected in Mongolian general education textbooks and to identify existing gaps and opportunities for improvement. The study examines the causes and consequences and compares them with the experiences of some other countries. Currently, there is no specific program for intellectual property education, but the curriculum includes all stages of cognitive skills training. However, textbook-level empirical analysis of IP education is lacking in Mongolia, and the content of textbooks needs to reflect the protection of intellectual property rights and how to use them effectively.

The main research questions of this study are as follows:

a. To what extent, how, and in what form is the understanding of intellectual property reflected in Mongolian general education textbooks?

b. How much time is allocated to intellectual property knowledge and information in curricula and textbooks?

c. Is there an opportunity to improve intellectual property and creative skills in the content of textbooks, and if so, how can this be achieved?

2. THEORETICAL BACKGROUND

The Mongolian Law on General Education (K-12 or combination of primary, secondary/middle and high school education) states that the goal is to develop students with the basic knowledge and skills necessary for independent learning and living, and to develop moral, responsible, and career-oriented citizens [15]. The goals of education are legislated to be implemented in collaboration with the child's parents, guardians, caregivers, local self-government and administrative bodies, and civil society organizations.

The 2023 Order of the Minister of Education and Science of Mongolia approved the requirements for educational materials for primary and secondary schools. Learning materials include technical tools, instruments, equipment, reagents, physical displays, printed materials, textbooks, video presentations, digital tools, etc. to be used to implement learning methods [16]. The order approved general and specific requirements for educational materials. General requirements state that materials must be scientifically sound and appropriate to the age and cognitive development of the student. Scientific concepts, definitions, laws, and principles must be formulated correctly, free from logical contradictions, appropriate to the stage of development of attention, memory, thinking, and language, consistent with the needs and interests of the learner, and consistent with the content of the curriculum. There are also 6 criteria for supporting students' creativity.

These requirements and criteria emphasize scientific accuracy, creativity, and coherence with the curriculum. Therefore, they provide a sound basis for analyzing how the concept of intellectual property is reflected in textbooks, as IP education inherently involves creative thinking and practical application of knowledge.

The content of general education will be determined by the development of knowledge and skills in mathematics, natural sciences, social sciences, humanities, language, communication, physical education, art, aesthetics, electronic and design technology, civic education, and life skills. A curriculum is a continuous, comprehensive activity that includes the processes of planning, developing, testing, improving, implementing, and evaluating. The findings suggest that the structure and content of textbooks and curricula may influence intellectual property knowledge and creativity among students [16].

The general education curriculum aims to discover and develop talents, interests, and skills to master the methods of performing intellectual tasks and actions, to have a desire to learn, and to develop the ability to think creatively to come up with new creative ideas for performing any activity, and to be able to prove them.

3. RESEARCH METHODOLOGY

Textbooks have been available as PDF files on the www.econtent.edu.mn website since 2019. All textbooks for grades 1-12 were downloaded from this site in PDF format and searched using content analysis method after using OCR program to read the content. Keyword search method was used as a pre-filtering tool for content related to intellectual property.

All textbooks for grades 1–12 were downloaded in PDF format, and an OCR program was utilized to enable text searching. The search was conducted with essential and frequently used keywords related to IP such as copyright, trademark, invention, utility models, geographic indications, product designs, new ideas, patents, innovations, licenses, intellectual property, etc. The criteria for this content analysis were type of textbooks, content, classes, and lessons.

Due to the vast number of textbooks and content, an Artificial Intelligence (AI) tool was utilized to effectively filter out relevant information as raw data, and Microsoft Excel was used to aggregate the raw data. No other application of AI

was present, such as in content analysis and conclusion. In order to identify and compare changes in content related to intellectual property, textbook files published in 2021 (previously utilized for former work endeavor) and in 2025 academic year on econtent.edu.mn website were downloaded and used.

The list of textbooks to be used in general education courses is approved by the government member responsible for education [17]. According to the curriculum plan, grades I-V are considered primary, grades VI-IX secondary, and grades X-XII high school.

4. RESULTS AND DISCUSSION

4.1 Results

In 2021, a total of 99 textbooks were used, specifically, 11 in primary education, 18 in secondary education, and 16 in high school education subjects [18] (econtent.edu.mn). The planned curriculum for the 2025-2026 school year for elementary, secondary, and high school are as follows: The duration of school year for primary is 32 weeks and the number of classes per day is 4.2-5.4, while the school year for secondary school is 33 weeks and 6th grade classes are 5.8 hours per day, and 7-9 grade classes are 7 hours per day. High school students are scheduled to attend 33 weeks of instruction per year with 7 hours a day. In terms of the variety of subjects taught, 12 for primary, 20 for secondary, and 16 for high school. A 60-hour preparatory program is implemented in secondary, and the teacher-directed hours are 64 in grade I, decreasing as the grade progresses in grades II-IV, reaching 268 in secondary school, and 144 in high school.

The results of the research conducted in the 2021 textbook were compared with those in 2025. In 2021, according to the Education Curriculum, the total annual hours for grades VII-XII are 5973 (VII-1155, VIII-1155, IX-1155, X-957, XI-957, XII-594, calculated in core hours). Of the total hours, 9 hours of lessons are allocated for education in intellectual property (one topic was considered 2 hours). In other words, 0.15% of the total course content was assigned to providing students with information about intellectual property. In 2025, a total of 147 textbooks were available across all grades. The largest number of these textbooks, 66 or 44.9%, were for grades VI-IX of secondary school, and 42 or 28.6% for grades X-XII of high school, and 39 or 26.5% for grades I-V of primary school.

Table 1. Education textbooks, by grade, percent

Grade	***textbooks***	***percent***
Primary (I–V grade)	39	26.5
Secondary (VI–IX grade)	66	44.9
High (X-XII)	42	28.6
Total	147	100.0

According to the analysis, grades 7, 8, and 9 have the most textbooks. These grades also have the most hours of instruction with 1155 hours per year.

We examined the advance of knowledge and information about intellectual property as well as the correlation between subjects in the content of textbooks for grades 1-12 in 2021 and 2025. A total of 99 textbooks were reviewed in 2021 and 147 textbooks in 2025, which shows an increase of 48 textbooks from 2021 to 2025. The number of lessons related to intellectual property increased from 7 in 2021 to 12 in 2025, indicating an increase of 5 lessons. The total percentage of class time related to intellectual property has increased threefold, from 0.15 percent of total teaching hours in 2021 (approximately 9 hours) to 0.45 percent or approximately 30 hours in 2025.

While the content of the textbook in 2021 was dominated by the IP keywords and concepts of "copyright", "invention", and "innovation", in 2025 the content of intellectual property was more widely reflected, covering topics such as "brand",

"patent", "cultural production" and others. The concept of intellectual property is presented in the form of direct knowledge and understanding in elementary grades, development of creative thinking skills and application in secondary grades, while in high school, the concept of innovation, licenses, and patents is reflected in a more in-depth way to further educate on developing creative thinking skills. There has also been an increase in the number of class hours spent on IP. The amount of content related to intellectual property in 2021 and 2025 has increased fourfold. The understanding of intellectual property has been enhanced in the form of ethics and labor values in primary school, creativity in secondary school, and innovation and licensing in high school.

Table 2. The concept of intellectual property, 2021, 2025 year

	2021 year	**2025 year**	**Comparison**
Textbooks	99	~147	+48 textbook
Lessons related to intellectual property	7	12	+5 lesson
Time related of intellectual property	9 (0.15%)	~30 (0.45%)	+3 times
Related of intellectual property	copyright, invention, patent, innovation...	innovation, brand, patent, cultural production...	The content improved

Compared to 2021 and 2025, the content and understanding of intellectual property has been expanded, and intellectual property knowledge and understanding has been included more in textbooks. However, despite this relative increase, the emphasis on the concept of intellectual property remains insufficient in terms of total lessons and time spent in primary, secondary, and high school.

Although the total time devoted to intellectual property is not sufficient for primary, secondary, and high school, the topic is mentioned in other subjects such as Mongolian Ethics and creative lesson in primary school, in the Design Technology lesson in secondary school (inventing new ideas, trademark, logos, and products), and in the Social Studies lesson in high school (granting of patents for authors, copyright and patent).

Figure 1. Knowledge of IP, by in textbooks, by grade, and by total percentage

When considering the understanding of intellectual property in primary, secondary, and high education grades, the content is effective in linking the concept of IP to ethics, and providing a deeper understanding of creativity, innovation, and legal issues.

Table 3. Intellectual property knowledge, textbook mentions and content

Grade	Subject	IP Keywords	Depth of Coverage	Hours Allocated	IP Notes
Primary	Mongolian Ethics	Morality and ability to do creative	Basic	0.15	The concept of IP is connected to morality.
Middle	Design Technology	Design new ideas, logos, trademark and products	Intermediate	0.2	The beginning of creativity and innovation
High	Social Studies	Intellectual property, copyright, patents	Advanced	0.1	Deeper legal understanding
Summary	Total Subjects: 3			0.45	

All textbooks also include copyright notices, author names, organization names, and prohibitions on copying.

4.2 Discussion

The result of the study shows that although the concept of intellectual property (IP) has increased somewhat in recent years in the Mongolian general secondary education curriculum, it is not systematically and comprehensively reflected. In 2021, content related to IP in high school textbooks accounted for 0.15% of total instructional time, but in 2025, this figure tripled to 0.45%. Although the findings indicate a relative increase in intellectual property-related content, the overall proportion remains insufficient for systematically fostering intellectual property awareness at the general education level. This represents progress, but is not yet sufficient. Although the number of textbooks has increased from 99 to 147, the number of lessons that include the concept of Intellectual Property has increased from 7 to 12, indicating an expansion in the scope of content.

Although the total time devoted to intellectual property concepts is not sufficient for primary, secondary, and high education grades, the progression is appropriate. In primary education textbooks, the concept of intellectual property was usually covered in the Mongolian Ethics and Education class, which focused on developing morals and creative talents. In secondary education textbooks, the concept of intellectual property was often taught in Design Technology classes, which were meant to be the beginning of creative thinking and innovation. These were lessons that included creating new ideas, logos, trademarks and products. However, in high school, the understanding of law, patents, licenses, and innovation is taught, and the Social Studies course goes into more depth about Intellectual Property, Copyright, and Patents, indicating that the quality of knowledge and understanding has improved as the class progresses and is developing in accordance with the hierarchy. However, the coherence between IP subjects is weak, the content is disorganized, and the level of providing students with systematic knowledge is not reached.

Internationally, special attention is paid to improving intellectual property education, including it in the curriculum, and innovative measures are taken to introduce and implement special development education programs. However, in Mongolia, the concept of intellectual property is only partially reflected in the content of some courses, indicating the need for elaboration at the policy level.

Mongolia's "Education Policy 2021–2030" clearly states the goal of expanding innovation and technology education. However, intellectual property education is currently not fully reflected in the curriculum and textbook content as a special

topic or independent curriculum. This shows that students have limited opportunities to gain in-depth knowledge of concepts such as intellectual property rights, copyright, patents, and innovation protection when participating in creative activities. It is evident that there is a need to integrate knowledge and understanding of intellectual property into the education system more broadly and in depth, and to integrate it across subjects. It is important to not only provide students with legal knowledge about the types of intellectual property and its protection, but also to develop an ethical understanding of respecting the value of creativity and innovation and protecting individual intellectual property.

The fact that each topic in the textbook is assessed and reinforced has the advantage of assessing students and determining whether they have mastered the knowledge, so theoretical knowledge and information can be presented in a comprehensive manner, evaluated, and improved. In doing so, it is effective to tailor the information to the child's age and mental characteristics and to tailor the lesson. For example, it is possible to integrate knowledge and information about intellectual property into the content of all design cartography and technology courses and provide theoretical knowledge in some content of information technology, geography, and social studies. It is also possible to include the stage of obtaining a patent by including legal provisions for high school students.

Further research is needed on the following issues:

- Integrate IP concepts in all classrooms and align content across subjects.
- Incorporate intellectual property and innovation awareness into teacher developmental curriculum.
- Collaborate with intellectual property professional organizations to develop a unified program.
- Implement practical measures to enable students to generate new ideas from their lessons and obtain patents.

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Developing children's creative thinking from an early age and shaping them into citizens who respect intellectual property is a key educational objective. Increasing the content of intellectual property in Mongolia's general education curriculum and textbooks is not just about providing legal knowledge, but also a strategic step that may potentially contribute to developing students into citizens who support a creative, fair, and innovative culture.

The study found that the gradual emphasis of the understanding of intellectual property from elementary to high school is effective, but there is no specific systematic program, the quality of the content is insufficient, and it can be considered haphazard. This topic is new in Mongolia and there is limited research done on it. Therefore, further detailed research is needed in this area.

The results of the study show that developing intellectual property education through textbooks and curricula may potentially support students' creative thinking, innovative knowledge, and the ability to responsibly deal with intellectual property. It is emphasized that the current content of intellectual property in Mongolian general education textbooks is insufficient. In the future, it is possible to develop and implement policies and long-term educational plans.

5.2 Recommendations

Based on the findings, this study suggests that the content related to intellectual property in general education textbooks should be increased. The following recommendations are proposed:

For education policymakers

- Systematically increase the content by incorporating intellectual property concepts into curriculum, textbooks, and plans. This includes knowledge of the legal protection of all objects, including inventions, utility models, product designs, trademarks, geographical indications, and copyrights, as well as international patents and technological advances.
- Develop and implement a comprehensive program plan in collaboration with intellectual property professional organizations. Collaborate with the World Intellectual Property Organization and other professional organizations as needed.
- In addition to increasing the content of the curriculum and textbooks, explore the possibility of extracurricular training and self-development.
- Explore and implement the possibility of including intellectual property in teacher professional development programs.

For Teachers:

- Request the relevant authorities to include intellectual property and innovation training in teacher professional development programs.
- Understand the steps from generating new ideas to obtaining a patent and involve students in creative projects to innovate a product of their own.
- Develop ethical understanding and use methodologies that support creative thinking.

For the Authors of Textbooks:

- Enrich the content in a hierarchical manner: ethics in the elementary grades, creative use in the secondary school grades, legal knowledge in the high school grades, etc.
- Enrich by including practical examples in the exercise section, patent application stages, success stories of inventors, etc.
- Seek advice, cooperation, and opinions from intellectual property professional organizations and experts.

Other Measures:

- Organize seminars, trainings, meetings with inventors, and exhibitions in collaboration with professional intellectual property organizations.
- Develop digital content, online platforms, and interactive learning materials.
- Encourage students: introduce opportunities for patenting new ideas, organize competitions, programs, and provide support.

Finally, integrating intellectual property education with educational policies and programs to provide and develop children with knowledge and skills in this area has the potential to contribute to Mongolia's transition to a knowledge- and technology-based economy.

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AUTHOR'S INTRODUCTION

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Erdenetsetseg Tsogbadrakh is a PhD student at the National University of Mongolia and working as patent examinier at the Intellectual Property Office of Mongolia. She conducts research in the fields of educational evaluation, intellectual property education, and educational theory. This article resulted from my PhD research conducted from September 2021 to December 2025. Erdenetsetseg Tsogbadrakh is involved in the conceptualization, analysis and fieldwork of this research work

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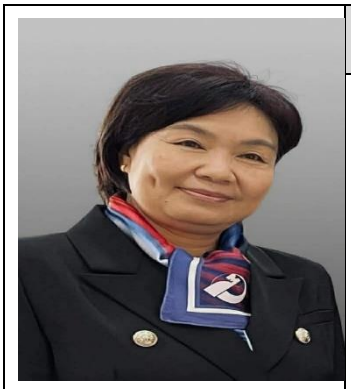

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