



Original Article

Awareness and needs for intellectual property education among health-related department university students

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ABSTRACT

Objectives: This study aimed to measure the awareness and needs for intellectual property (IP) education among university students majoring in health-related fields to inform the development of future IP education curricula. **Methods:** The study was conducted through an online survey from January 5 to 26, 2024, targeting students from the health-related departments (Department of Physical Therapy, Health Administration, Clinical Laboratory Science, and Dental Hygiene) at Dankook University located in Cheonan City, Chungcheongnam-do. **Results:** A total of 151 students participated in the survey. Among the respondents, 84.8% were women, and the largest groups of respondents were from the Health Administration and Dental Hygiene departments, each accounting for 32.5%. Only 13.9% of the respondents had taken courses related to IP, and 22.5% had related activity experience. The overall average importance score of IP education was 3.88 (± 0.80), and the overall average need score was 3.78 (± 0.80). An Importance-Performance Analysis (IPA) Matrix analysis revealed that 13 topics fell into the first quadrant (high importance, high need), one topic into the second quadrant (low importance, high need), 18 topics into the third quadrant (low importance, low need), and four topics into the fourth quadrant (high importance, low need). The educational topics identified as first quadrant include 'Securing patent rights', 'Requirements for patent registration', 'Effects and contents of patent rights', 'Patent infringement and remedies', and 'Effects and contents of copyrights'. **Conclusions:** Future IP education programs should develop innovative educational content and methods that consider both the importance and needs to increase students' interest and engagement.

Key Words: Educational needs, Intellectual property, Intellectual property education, University students

Introduction

The importance of intellectual property rights (IPR) has been increasing in recent years. According to the Basic Law on Intellectual Property, intellectual property (IP) refers to knowledge, information, technology, expressions of ideas or emotions, business signs, varieties of biological resources, and other intangible assets created or discovered through human creative activities or experiences, which possess potential property value [1]. Specifically, individuals or companies holding IP rights are legally protected for a period ranging from 10 to 20 years for patents, and up to 70 years posthumously for copyrights. This protection allows them to generate revenue from their IP, thereby enhancing the credibility of companies possessing such rights and aiding in the maintenance of

their business operations [2]. Consequently, the monopolistic nature of IPR amplifies their significance [3].

In particular, the rapid advancement of technology in modern society has made it easier to produce counterfeit or imitation goods, resulting in an increasing number of cases of IP infringement [4,5]. The global counterfeit market is estimated to account for approximately 10% of total trade, leading to significant reductions in tax and customs revenue [4]. Therefore, securing IPR is essential not only for protecting individuals and companies but also for ensuring a minimal level of competitiveness.

IPR are particularly crucial in the healthcare sector. This is because healthcare businesses can commercialize products with just a few patents, enabling significant revenue generation and market monopolization [6]. Consequently, patents in the healthcare field often lead to disputes, and the damages awarded in such disputes can be astronomical [7]. The recent COVID-19 pandemic underscored the importance of IP issues, such as patents, in vaccine development and international trade relations [8]. Therefore, to drive the future of the healthcare sector, it is imperative to protect IPR. This necessitates strategic planning and preparation to address these challenges effectively.

Despite the government's efforts to expand both the quantity and quality of IP education in accordance with the comprehensive plan for the development of intellectual property personnel, IP education for health-related majors remains unstandardized [9]. Currently, IP education is predominantly conducted within engineering faculties, while other departments primarily offer one-time, non-curricular programs [10]. To enhance the effectiveness of high-quality education, it is essential to first understand the current status of the target audience.

Existing research on IP education has primarily focused on universities specializing in science and technology, IP education leading universities' students or graduates, and those majoring in science and engineering fields [11-13]. In contrast, this study aims to assess the awareness and demand for IP education among students majoring in health-related departments. By integrating these findings into future IP curriculum development, the study seeks to provide a more comprehensive understanding of the overall awareness and importance of IP education across various academic disciplines. Furthermore, this research aims to identify gaps and opportunities in the current IP education framework, ultimately making a significant contribution to the field by addressing these discrepancies and enhancing the inclusivity and effectiveness of IP education programs.

Methods

1. Research subjects and data collection methods

This study was conducted to assess the importance and demand for IP education among students in the health-related departments (Physical Therapy, Health Administration, Clinical Pathology, and Dental Hygiene) at D University, located in C City, Chungcheongnam-do. To achieve the research objectives, an online survey was administered to the target subjects from January 5 to January 26, 2024. Using G*power 3.1, the desired sample size was calculated to be 139, based on an effect size of 0.25, $\alpha=0.05$, and power of 0.90. Considering potential data errors, dropout rates, and data completeness, a total of 200 participants were targeted. During the survey period, 153 responses were received, and after excluding 2 insincere responses, 151 responses were used for analysis.

Students were informed about the online survey, which aimed to assess awareness and demand for IP education, through online community channels. Those interested in participating were able to voluntarily complete the survey via a distributed survey URL. Participants were informed in advance that they could withdraw from the study at any time, and that the collected data would not be used for any purposes other than the research.

Ethical considerations for research participants were addressed in accordance with the guidelines outlined in the Declaration of Helsinki. The study received approval from the Institutional Review Board of Dankook University (DKU IRB No. 2023-10-026-004). Only students who listened to the explanation of the research purpose and voluntarily agreed to participate were included in the study.

2. Research tools

The importance and demand for IP education were measured using the research tool developed by Heo [14]. The topics for IP education were referenced from introductory materials developed by the Korean Intellectual Property Office and the Korea Invention Promotion Association [15]. The specific education topics were categorized into 12 items: Overview of intellectual property rights, Patent rights, Design rights, Trademark rights, Copyrights, Patent specifications, Patent information search, Prior art search, Patent mapping, Trade secrets and employee inventions, Utilization of intellectual property, and Intellectual property valuation. These topics were further subdivided into a total of 36 detailed subjects.

The importance and demand for each educational topic were measured using a 5-point Likert scale, where a response of 'very important' or 'highly desired' was scored as 5 points, and a response of 'not necessary at all' or 'not desired at all' was scored as 1 point. The reliability analysis of each item yielded Cronbach's α values of 0.976 for importance and 0.975 for demand.

3. Data analysis

The general characteristics of the subjects were analyzed using frequency analysis. The mean scores and standard deviation for the importance and demand of educational topics were analyzed using descriptive statistics. Differences in the importance and demand for educational topics were analyzed using paired sample t-tests. The results were further interpreted using the Importance-Performance Analysis (IPA) Matrix method, which evaluates the relative importance and demand of each educational topic simultaneously to assess the direction of the education.

All statistical analyses were conducted using IBM SPSS program (ver. 26.0; IBM Corp., Armonk, NY, USA) with a significance level set at 0.05.

Results

1. General characteristics

The study included a total of 151 participants, of which 128 were female (84.8%) and 23 were male (15.2%). The majority of participants were in their fourth year (30.5%) <Table 1>. The most common majors were Health Administration and Dental Hygiene, each comprising 32.5% of the participants, followed by Clinical Pathology (19.2%) and Physical Therapy (15.9%). Only 13.9% of respondents had experience taking courses related to IP, and 22.5% had participated in related activities.

Table 1. General characteristics and IP-related course experience of study subjects (N=151)

Characteristics	Division	N	%
Gender	Male	23	15.2
	Female	128	84.8
Grade	First year	28	18.5
	Second year	41	27.2
	Third year	36	23.8
	Fourth year	46	30.5
Major	Physical therapy	24	15.9
	Health administration	49	32.5
	Clinical pathology	29	19.2
	Dental hygiene	49	32.5
Experience in taking courses related to intellectual property	No	130	86.1
	Yes	21	13.9
Experience in activities related to intellectual property	No	117	77.5
	Yes	34	22.5

Table 2. Difference of importance and demand for intellectual property education

Topic	Section	Importance		Demand		Difference	
		Mean	SD	Mean	SD	t	p [*]
A Overview of intellectual property	A1 Overview of intellectual property rights	3.78	0.70	3.61	0.78	0.17	0.002
	A2 Recent trends in intellectual property rights	3.91	0.80	3.76	0.78	0.15	0.017
	A3 Website related to intellectual property	3.59	0.80	3.58	0.78	0.01	0.902
B Understanding the patent rights system	B1 Securing patent rights	4.02	0.73	3.93	0.71	0.09	0.094
	B2 Requirements for patent registration	4.04	0.78	4.00	0.73	0.04	0.493
	B3 Effects and contents of patent rights	4.16	0.69	4.00	0.71	0.16	0.011
C Understanding the design rights system	B4 Patent infringement and remedies	4.26	0.68	4.08	0.73	0.18	0.001
	B5 Difference between a utility models and a patents	3.81	0.81	3.70	0.78	0.11	0.078
	C1 Securing design rights	3.76	0.73	3.71	0.77	0.05	0.367
D Understanding the trademark right system	C2 Requirements for establishing and registering designs	3.91	0.77	3.77	0.75	0.15	0.024
	C3 Unique systems under the design protection act	3.83	0.80	3.70	0.77	0.14	0.018
	D1 Concept of trademark and secure of trademark rights	4.04	0.68	3.93	0.74	0.11	0.052
E Understanding the copyright right system	D2 Requirements for trademark registration	4.05	0.77	3.93	0.76	0.11	0.068
	D3 Contents and neighboring concepts of trademark rights	3.91	0.84	3.74	0.76	0.17	0.012
	E1 Works	4.10	0.76	3.96	0.77	0.14	0.009
F Understanding and drafting patent specifications	E2 Authors	4.03	0.82	3.92	0.79	0.11	0.035
	E3 Effects and contents of copyrights	4.15	0.75	4.05	0.70	0.09	0.071
	E4 Neighboring rights	3.96	0.75	3.83	0.76	0.13	0.020
G Patent information research and classification	F1 Understanding patent specifications	3.75	0.76	3.72	0.81	0.03	0.571
	F2 Organization of a patent specification	3.76	0.76	3.68	0.81	0.08	0.181
	F3 Overview of patent claims	3.82	0.78	3.73	0.82	0.09	0.122
H Methods and practice of prior research	G1 Overview of patent information research	3.69	0.78	3.59	0.82	0.10	0.116
	G2 Classifications of patents	3.90	0.85	3.80	0.81	0.10	0.096
	H1 Searching patent information using keywords	3.83	0.78	3.74	0.82	0.09	0.178
I Utilization of patent information and patent maps	H2 Utilizing the search DB	3.90	0.79	3.82	0.83	0.08	0.146
	H3 Other search DB	3.77	0.87	3.70	0.83	0.07	0.146
	H4 Prior research practice	3.68	0.81	3.68	0.87	0.00	1.000
J Trade secrets and job Inventions	I1 Meaning and analysis of patent maps	3.68	0.82	3.57	0.84	0.11	0.094
	I2 The process of creating a patent map	3.74	0.82	3.64	0.80	0.10	0.100
	I3 Extracting valid patents	3.81	0.82	3.72	0.79	0.09	0.158
K Utilization of intellectual property	J1 Trade secrets	3.92	0.86	3.85	0.81	0.07	0.211
	J2 Job invention system	3.75	0.79	3.67	0.85	0.08	0.241
	K1 Intellectual property management	3.84	0.82	3.79	0.81	0.05	0.465
L Intellectual property valuation	K2 Technology transfer	3.74	0.76	3.65	0.78	0.09	0.109
	L1 Overview of intellectual property valuation	3.76	0.81	3.63	0.86	0.13	0.031
	L2 Contents of intellectual property valuation	3.89	0.80	3.75	0.76	0.13	0.018

SD: standard deviation; DB: database

^{*}by paired t -test

Discussion

This study was conducted to analyze the perceived importance and demand for IP education among health-related students, with the aim of informing future IP education initiatives.

The results showed that only 13.9% of respondents had taken courses related to IP, and only 22.5% had participated in activities related to IP or idea creation. This indicates a significant lack of exposure to IP education and activities among health-related students. Therefore, to respond to the rapidly changing medical environment and technological advancements, it is necessary to create a university environment where health-related students can receive adequate education on IP.

At D university, health-related department students showed higher scores for the perceived importance of IP education compared to their scores for the demand for such education. This indicates that while students highly recognize the importance of IP education, their actual demand for receiving this education is relatively lower. This suggests that students acknowledge the necessity of IP education but have a relatively low proactive desire to pursue it. This phenomenon could be due to the lack of connection between the educational content and their major, career, or professional development, making it difficult for them to perceive the practical necessity of IP education [16,17]. In conclusion, if the value and practical applicability of IP education are clearly presented to students, focusing on its relevance to their field of study and future careers, it could increase their demand for such education and maximize its effectiveness.

The IPA analysis results indicated that there were 13 lecture topics with both high importance and high demand. In particular, students rated topics related to patent rights, such as 'Securing patent rights', 'Requirements for patent registration', 'Effects and contents of patent rights', 'Patent infringement and remedies', as well as 'Effects and contents of copyrights', as having high importance and demand. This finding can be interpreted in connection with the fact that students have had limited experience in taking courses related to intellectual property (IP) and few opportunities to participate in activities associated with IP or idea generation. This suggests that students are likely to have an insufficient understanding of topics beyond patents and copyrights. In practice, when opportunities for relevant experiences are restricted and awareness is low, students tend to rate their educational needs in this area lower [11-13]. Therefore, future IP education should focus on these topics with high importance and demand to elicit strong engagement and interest from students [18,19].

Based on these findings, we propose several strategies for effective IP education. First, the curriculum of IP should reflect the actual educational needs of students. Considering the high demand for basic knowledge of patents and copyrights in this study, it is believed that education centered on cases of intellectual property related to medical devices and medical apparatuses would be more effective for students in the health field. It is crucial to design the curriculum to include practical examples and applications related to students' majors or future employment.

Second, IP education courses need to emphasize practice-oriented learning as well as theoretical education. Given that health-related students have limited opportunities for IP education and may find the subject unfamiliar, it is essential to foster interest and engagement through experiential learning, such as patent creation exercises, rather than focusing solely on theoretical knowledge. Therefore, incorporating workshops, seminars, and mentoring programs alongside theoretical instruction would be more effective.

Third, it is necessary to prepare a plan to increase the actual voluntary participation by raising awareness of IP education. In this study, the result of students' low demand for IP education while recognizing the importance of IP education means that students can only participate if they themselves recognize the importance of IP education, and the outcome and effectiveness of education can be improved. Promoting the value and relevance of IP education to students' academic and professional lives will help achieve this goal.

This study is significant in that it assessed the importance and demand for IP education among health-related students. However, the study was conducted with students from a university located in C City, Chungcheongnam Province, which limits the generalizability of the findings. Additionally, as the survey was only conducted among health-related students, it is challenging to

identify differences with students from other disciplines and majors. Therefore, future research should expand the survey to include university students nationwide, evaluating the demand for IP education based on location, major, and other factors to propose more detailed educational strategies. Furthermore, it is suggested that future studies evaluate the effectiveness of various IP education contents, methods, and assessments currently implemented in universities. Developing models to assess IP competency at different levels would also be beneficial.

Conclusions

At a time when the importance of IP is becoming increasingly prominent, health-related students demonstrated a high level of importance and necessity for IP education.

1. Only 13.9% had actually taken courses related to IP, indicating a very low level of engagement.

2. Given the higher perceived importance compared to demand for IP and the high importance and demand for educational topics such as 'Securing patent rights', 'Requirements for patent registration', 'Effects and contents of patent rights', 'Patent infringement and remedies', and 'Effects and contents of copyrights', future IP education curricula should incorporate educational content and innovative teaching methods that can enhance students' interest and engagement.

This approach is essential to ensure that students not only recognize the significance of IP but also actively seek to understand and apply it.

Notes

Author Contributions

Conceptualization: JH Jang; Data collection: JW Park; Formal analysis: JE Hwang; Writing-original draft: JE Hwang; Writing-review&editing: JH Jang, JE Hwang, JW Park

Conflicts of Interest

JH Jang has been a member of editorial committee of the Journal of Korean Society of Dental Hygiene. She is not involved in the review process of this manuscript. Otherwise, there was no conflicts of interest.

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Ethical Statement

This study was approved by the Institutional Review Board (IRB) of Dankook University (IRB No. 2023-10-026-004).

Data availability

Data can be obtained from the corresponding author.

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References

1. Basic law on intellectual property [Internet]. Ministry of Science and ICT[cited 2024 Jul 16]. Available from: <https://www.law.go.kr/법령/지식재산기본법>.
2. Brueckmann W. Intellectual property protection in the European community. In *Intellectual Property Rights In Science, Technology, And Economic Performance* 2019:291-310.
3. Kye SK. The sharing economy and intellectual property. *J Intellect Prop* 2018;13(1):219-44. <https://doi.org/10.34122/jip.2018.03.13.1.219>
4. Olubiyi IA, Emerole UA, Adetula AF. Contemporary challenges to intellectual property rights in developing countries: looking beyond the laws (Nigeria as a case study). *IIC* 2022;53(1):5-30. <https://doi.org/10.1007/s40319-021-01138-7>
5. Kim MS, Choi YD, Park HJ, Chun SR. A study on the leakage of core technologies in small and medium enterprises. *Korean Academic Society of Business Administration Convergence Academic Conference* 2007: 1-10.
6. Bai G, Rajgopal S, Srivastava A, Zhao R. Profitability and risk-return comparison across health care industries, evidence from publicly traded companies 2010–2019. *Plos One* 2022;17(11):e0275245. <https://doi.org/10.1371/journal.pone.0275245>
7. Gurgula O. Strategic patenting by pharmaceutical companies-should competition law intervene? *IIC* 2020;51(9):1062-85. <https://doi.org/10.1007/s40319-020-00985-0>
8. Park SP, Lee HJ, Yu Y, Lee EYJ, Park YS. Designing the global vaccine supply chain: balancing intellectual property rights with post COVID-19 vaccine equity. *BMJ Global Health* 2023;8(11):e013669. <https://doi.org/10.1136/bmjgh-2023-013669>
9. Son SW, Kim HK, Park KM, Kim GH. Comparison of perception on educational experiences and educational outcomes of educational consumers at intellectual property education leading university. *J Korean Ind Educ Assoc* 2021;46(1):186-207. <https://doi.org/10.35140/kiiedu.2021.46.1.186>
10. Jo JS, Song YS. Curriculum model plans to extend the IP training base. *J Contents Comput* 2016;17(5):329-38. <https://doi.org/10.9728/dcs.2016.17.5.329>
11. Kim YM. A study on analysis of KAIST students' perceptions of intellectual property and start-ups and educational needs. *JEEP* 2021;24(6):20-9. <https://doi.org/10.18108/jeer.2021.24.6.20>
12. Jeong DH, Choi YH. Development of a standard for educational content on intellectual property literacy of university students and analysis of education needs. *J Korean Inst Indust Educ* 2021;46(1):110-38. <https://doi.org/10.35140/kiiedu.2021.46.1.110>
13. Son S, Kim H, Park K, Kim G. Comparison of perception on educational experiences and educational outcomes of educational consumers at intellectual property education leading university. *J Korean Inst Indust Educ* 2021;46(1):186-207. <https://doi.org/10.35140/kiiedu.2021.46.1.186>
14. Heo SE. Analysis of intellectual property education of elementary school teacher[Master's thesis]. Daegu: Daegu National University of Education, 2017.
15. Cha HT, Lee DH, Won KM, Shin JK. Introduction to easily written intellectual property. Seoul: Parkmungak; 2023.
16. Hsu AJ, Chen MYC, Shin NF. From academic achievement to career development: does self-regulated learning matter? *Int J Educ Vocat Guidance* 2022;22(2):285-305. <https://doi.org/10.1007/s10775-021-09486-z>
17. Lee CM, Chung JY, Yang MS. An analysis of learner education needs for the operation and contents of liberal arts curriculum. *Korean J General Edu* 2020;14(5):109-21. <https://doi.org/10.46392/kjge.2020.14.5.109>
18. Yoon JW, Je NJ, Park MR. Analysis of the importance-performance and educational needs on digital media literacy of university student. *J Hum Soc Sci* 21 2022;13(2):1133-42. <https://doi.org/10.22143/HSS21.13.2.80>
19. Choi HJ, Kim MH, Lim JH. Analysis of awareness and demand for new nurses' core competency skill education program using IPA technique. *J Learn Cent Curric Instr* 2023;23(6):423-44. <https://doi.org/10.22251/jlcci.2023.23.6.423>

보건계열 대학생의 지식재산 교육에 관한 인식도 및 요구도

초록

연구목적: 본 연구는 보건의료계열 전공 대학생들을 대상으로 지식재산 교육에 대한 인식도와 요구도를 측정하여 향후 지식재산 교육 과정 개발 시 반영하기 위한 목적으로 수행되었다. **연구방법:** 본 연구는 충청남도 C시에 소재하고 있는 D대학교 보건계열(물리치료학과, 보건행정학과, 임상병리학과, 치위생학과) 재학생을 대상으로 2024년 1월 5일부터 2024년 1월 26일까지 온라인 설문조사를 실시하였고 151명이 설문에 참여하였다. **연구결과:** 응답자의 84.8%는 여학생이었으며, 보건행정학과와 치위생학과 전공자가 각 32.5%로 가장 많았다. 응답자의 13.9%만이 지식재산 관련 교과목을 수강한 경험이 있었고, 이와 관련된 활동 경험은 22.5%로 나타났다. 보건계열 대학생의 지식재산 교육 중요도의 평균 점수는 3.88(± 0.80)점이며, 요구도의 평균 점수는 3.78(± 0.80)점이었다. IPA Matrix분석을 실시한 결과, 1사분면(높은 중요도, 높은 요구도)에 13개 주제, 2사분면(낮은 중요도, 높은 요구도)에 1개 주제, 3사분면(낮은 중요도, 낮은 요구도)에 18개 주제, 4사분면(높은 중요도, 낮은 요구도)에 4개 주제가 포함되었다. 1사분면에 위치한 교육 주제는 ‘특허권 확보’, ‘특허 등록 요건’, ‘특허권의 효력’, ‘특허 침해 및 구제’, ‘저자권의 효력’ 등으로 나타났다. **결론:** 향후 지식재산 교육과정 운영에서 대학생들의 흥미와 관심을 높일 수 있도록 중요도와 요구도를 고려한 교육 콘텐츠 개발 및 혁신 교육방법이 적용되어야 한다.

색인: 교육 요구도, 지식재산, 지식재산교육, 대학생