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PROTECTION FOR NON-FORMAL EDUCATORS IN THE SECTOR OF INTELLIGENT TECHNOLOGY IN ACCORDANCE WITH TEACHER COMPETENCY STANDARDS TO ENSURE LEGAL CERTAINTY AND JUSTICE

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Abstract
The education sector plays a crucial role in preparing literacy skills with a new orientation and a generation ready to face the challenges of progress from the industrial revolution to the modern society era. Smart technology education currently comes from non-formal education. The government's response, through the Ministry of Primary and Secondary Education, is to issue an Academic Paper on Coding and Artificial Intelligence Learning, with the policy direction of revising the National Education System Law as an ideal concept for preparing smart technology education (robotics, coding, and artificial intelligence) into the national education system curriculum to provide legal certainty and justice for non-formal educators.
Keywords: Non-Formal Educators, Smart Technology, Legal Certainty and Justice

1. INTRODUCTION

The role of the national education system in Indonesia, based on Pancasila and the 1945 Constitution of the Republic of Indonesia, is to develop capabilities and shape the character and civilization of a dignified, morally upright, creative, and independent nation. Indonesia is one of the developing countries, and the education sector continues to improve in order to create a better education system. One form of improvement in Indonesian education is the revision of Law Number 2 of 1989 on the National Education System into Law Number 20 of 2003 on the National Education System.

Currently, the education sector plays a vital role in preparing literacy skills with a new orientation and generations to face the challenges of industrial revolution advancements toward the era of society. This literacy includes data, technology, and human resources literacy. Data literacy is the ability to analyze and use information from data emerging through the digital world. Technological literacy refers to the ability to understand technological systems and the mechanics of the working world, while human resource literacy is the ability to interact well, be flexible, and have strong character.

The presence of technology has undergone massive development, with various new features, functions, and interfaces, increasingly impacting many aspects of human

life, including the education sector. This undoubtedly has explicit implications for the future of human work. In today's increasingly competitive era, we must fairly acknowledge that the education sector needs intelligent technology education (such as robotics, coding, and artificial intelligence) to be included in the national education curriculum for every student, to help them develop their potential, so that education shapes personal skills and creativity.

As stipulated in Article 28C paragraph (1) of the 1945 Constitution, every person has the right to develop themselves through the fulfillment of basic needs, has the right to obtain education, and to benefit from science and technology, arts, and culture, to improve the quality of life and for the welfare of humanity. In reality, intelligent technology education (robotics, coding, artificial intelligence) is often obtained through non-formal education, which refers to learning that takes place outside of schools or formal educational institutions. This learning process is often unstructured and lacks a clear curriculum, unlike formal education.

The legal issue examined in this paper is that intelligent technology education has not been regulated in the national curriculum or in laws and regulations, and legal protection for non-formal educators in the sector of intelligent technology has not been specifically regulated in a comprehensive law or regulation.

2. RESEARCH METHOD

This paper on “Protection for Non-formal Educators in the Sector of Intelligent Technology in Accordance with Teacher Competency Standards to Ensure Legal Certainty and Justice” employs a doctrinal legal research method with conceptual and comparative approaches. The data used in the research are secondary data (books, journals, articles), which are then analyzed qualitatively to obtain research findings.

3. DISCUSSION

1. The Response of the Education Sector in Indonesia to Intelligent Technology Education (Robotics, Coding, Artificial Intelligence)

Education is a deliberate effort to build an advanced and just human civilization, characterized among others by achievements in science, technology, values, and humane traditions, as well as democratic, sovereign, prosperous, and socially just practices that do not harm the environment. Education must be responsive to changes in technology, society, economy, politics, and culture. This is because such changes necessitate shifts in the knowledge and life skills required by learners to be able to live and contribute meaningfully to broader society.

Education has become an important means of achieving these national goals, so the state needs to ensure that all citizens have equal access and opportunity to obtain decent and quality education. The state is obligated to guarantee access to quality education for all, based on a strong legal foundation, namely Law No. 20 of 2003 on the National Education System.

According to Philip H. Coombs, education in Indonesia is known to consist of informal education, formal education, and non-formal education, as explained below:

1. Informal education is the education a person acquires through daily experiences, either consciously or unconsciously, from birth until death.
2. Formal education is education known as school-based education, which is structured, systematic, and follows clear and strict requirements.
3. Non-formal education is organized and consciously conducted but does not strictly follow fixed and rigid regulations (Joesoef, 2008: 16).

With the advent of the Industrial Revolution 4.0, the Indonesian Robotics Education Foundation, as one of the non-formal education institutions based in Jakarta, has been providing robotics education (one of the sectors of intelligent technology). Jully Tjindrawan, MBA, as Founder of Yayasan Pendidikan Robotik Indonesia, stated that the socialization of the Robotics Extracurricular Program aims to encourage elementary schools in the DKI Jakarta Province to include robotics technology education in their extracurricular activities. She stated that the MoU between the DKI Jakarta Provincial

Government and the Indonesian Robotics Education Foundation, through their collaboration, aims to support robotics technology education activities so that the younger generation can continue to innovate and contribute to global advancements in robotics technology.

As times evolve, challenges within the national education system continue to increase, especially in facing social, economic, and technological changes. Therefore, regulatory evaluation, curriculum renewal, and strengthening of educational infrastructure are crucial steps to ensure the education system can meet the needs of future generations and support sustainable national development.

The urgency of integrating intelligent technology (Robotics, Coding, Artificial Intelligence) into education is increasingly growing alongside the development of Industry 4.0 and 5.0, which demand high-quality human resources with strong digital understanding and skills. Without adequate digital literacy and sufficient digital technology capabilities, the younger generation will face difficulties competing in a workforce that is becoming increasingly technology driven.

Therefore, the integration of intelligent technology (Robotics, Coding, Artificial Intelligence) into school curricula is not merely an innovation, but a fundamental necessity in building high-quality human resources who are adaptive to the changing times. The government, schools, industries, and communities need to work together to create a conducive educational ecosystem for the development of knowledge and skills, so that Indonesia is not merely a consumer of technology, but also a producer of innovations capable of competing globally.

As is known, several countries have already adopted intelligent technology education (Robotics, Coding, Artificial Intelligence) into their national education curriculum, such as:

1. China

Coding and AI education have been integrated into the primary and secondary school curriculum through the AI4Future initiative. This initiative was designed by the

Chinese University of Hong Kong (CUHK) to promote collaboration in implementing AI learning through diverse approaches tailored to local contexts (Chiu, 2021). The goal of teaching coding and AI in the Chinese context is to enable students not only to become technology users, but also future creators of innovation.

2. India

In 2020, NEP recommended the introduction of coding and AI as part of the national curriculum. Starting from grade 6, coding education is introduced, while AI is taught at the secondary school level. Coding and AI are delivered as part of Computer Science subject, although in some states such as Maharashtra and Karnataka, coding is introduced as a separate mandatory subject in secondary schools.

3. Australia

The Australian curriculum covers AI learning through content in the Mathematics and Technologies learning areas, from Foundation year to Year 10. In addition to Technologies and Mathematics, AI is also elaborated in other learning areas such as Science. This curriculum is also connected to key elements and organizing ideas from general capabilities and cross-curriculum priorities.

In the Technologies curriculum, students learn core concepts related to AI, including data, computational thinking, and systematic thinking. In the Mathematics, Technologies, and Digital Technologies subjects, AI is taught to develop students' general capabilities such as digital literacy, ethical understanding, critical and creative thinking, and numeracy, including the responsible application of AI by students.

The presence of intelligent technology education, as currently provided through non-formal education, has prompted a response from the Government through the Ministry of Primary and Secondary Education by issuing the Academic Paper on Coding and Artificial Intelligence Learning in Primary and Secondary Education. This document emphasizes the important role of teachers, educators, and technology practitioners in creating a collaborative, technology-based learning ecosystem capable of optimally developing students' potential.

2. The Ideal Concept and Policy Direction for Intelligent Technology Education (Robotics, Coding, Artificial Intelligence)

a. Protection for Non-formal Educators in the Sector of Intelligent Technology (Robotics, Coding, Artificial Intelligence) to Ensure Legal Certainty and Justice

A nation's development is closely linked to the advancement of its education system, particularly non-formal educational institutions, which serve as substitutes, supplements, or complements to formal education in supporting lifelong learning. Moreover, non-formal education is part of the national education system, aimed at developing human resources capable of building an intelligent and competitive nation in the global era.

One of the non-formal education activities in the field of intelligent technology that has been carried out since 2005 until now is by the institution Robotic Explorer World, which actively organizes workshops and competitions on how to build robots. The institution operates at Green Ville, Block AL 1-1A, Duri Kepa Village, Kebon Jeruk Subdistrict, West Jakarta City, DKI Jakarta, Indonesia, 11510. The purpose of this non-formal education is so that our generation will be able to become inventors of advanced technological products, especially in the field of robotics, therefore robotic technology as part of intelligent technology needs to be included in the national education system curriculum to be implemented at all school levels to support the industrial revolution 4.0 towards the society 5.0 era.

The successful implementation of coding and Artificial Intelligence education in many countries, from primary to secondary education levels, can be seen from the various supports provided, either by the government independently or through collaboration and partnerships with external parties. In practice, these countries strive to ensure that schools receive adequate support to be ready for implementation, such as teacher competency development, supporting facilities and infrastructure, and student readiness for learning.

Currently, the Government through several ministries related to education has developed strategies and learning designs for coding and artificial intelligence education to be implemented in formal educational institutions together with Training Implementation

Institutions (*Lembaga Penyelenggara Diklat* /LPD) for Coding and Artificial Intelligence Learning.

One of the Training Implementation Institutions (LPD) appointed by the Government through the Ministry of Primary and Secondary Education, following administrative and competent selection for conducting Coding and Artificial Intelligence Learning, is PT. Jully Tjindrawan Robotik, based on the Directorate General of Early Childhood, Primary, and Secondary Education Number 3644/C/DM.00.02/2025. The Training Implementation Institution (LPD) has several educators who meet the Teacher Competency Standards and provide instruction within non-formal education units.

This study examines the protection of non-formal educators in intelligent technology (robotics, coding, artificial intelligence) to ensure legal certainty and justice, particularly regarding constitutional recognition, which currently acknowledges teachers only as educators in formal early childhood education (PAUD). Whereas educators in non-formal early childhood education (PAUD) are not legally recognized as teachers, resulting in their exclusion from the national education system curriculum. In addition, they do not receive guarantees for developing their competencies, such as teacher certification, or welfare assurances such as basic salary, functional allowances, and special allowances.

Article 26 of the National Education System Law (UU Sisdiknas) only provides a legal basis for non-formal education. However, its implementation requires further regulations to ensure the rights of non-formal educators are guaranteed and protected. The forms of certainty and protection referred to, which are currently lacking for non-formal educators carrying out intelligent technological education, include among others:

1) Equal Rights: the need to ensure equal rights between formal and non-formal educators in terms of recognition, guarantees, protection, and fair legal certainty.
2) Job Security and Decent Livelihood: it is important to guarantee non-formal educators the right to job security and a decent standard of living, similar to formal educators.

3) Personal Development: providing equal opportunities for non-formal educators to develop themselves and their professional competencies, as provided to formal educators.
4) Professional Protection: protection for the profession of non-formal educators, including legal aspects, safety, health, and Intellectual Property Rights (IPR).

b. Preparing for the Integration of Intelligent Technology Education (Robotics, Coding, Artificial Intelligence) into the National Education System Curriculum

The government has made efforts to improve the quality of education through various policies, yet existing gaps still indicate that the government has not been serious enough in addressing the field of education. From an innovative learning perspective, the curriculum must be able to accommodate individual student differences, organize appropriate levels of difficulty, facilitate student interaction and participation, emphasize diverse learning methods, and encourage the development of new skills. In the era of the Industrial Revolution 4.0, the curriculum will face more complex challenges. Therefore, the curriculum must be seen as a dynamic document that continuously evolves with the times.

An innovative curriculum will serve as a medium for students to develop their abilities, particularly in problem-solving based on scientific methods and reflective thinking. The curriculum is a means for the government to support learners in addressing problems both through scientific approaches and reflective practices.

Based on the previous analysis of the Indonesian education sector's response to intelligent technology education (robotics, coding, artificial intelligence), the Ministry of Primary and Secondary Education, through the Academic Paper, needs to take the following strategic steps:

1) Integration of Coding and Artificial Intelligence into the Curriculum

a) Establishing Coding and Artificial Intelligence as an elective subject at the elementary school level (grades 5 and 6), junior secondary school (grades 7, 8, and 9), and senior secondary school (grade 10), with an allocation of two instructional hours per week.
b) For senior secondary level, grade 11 and 12, the time allocation may be increased to up to 5 instructional hours per week, while for vocational high schools (SMK) in grades 11 and 12, up to 4 instructional hours per week, adjusted according to the applicable curriculum structure.
c) Providing flexibility for educational units to continue developing Coding and Artificial Intelligence through extracurricular activities or by integrating them into other relevant subjects.

2) Strengthening Regulations and Learning Outcomes
a) Revising regulations regarding curriculum structure to include Coding and Artificial Intelligence as an elective subject at each educational level.
b) Formulating and aligning the learning outcomes for the Coding and Artificial Intelligence subject to be consistent with the learning outcomes of Informatics.

The preparation for integrating intelligent technology education (Robotics, Coding, Artificial Intelligence) into the national education system curriculum, particularly in relation to regulations and legal policies, must continuously adapt to technological developments. Progressive and responsive legal updates to technological changes are key to ensuring justice and legal order in the digital era. This requires collaboration among the government, legal institutions, and other stakeholders to develop a comprehensive and relevant legal framework.

The academic paper outlined above aligns with the statement made by the Minister of Primary and Secondary Education (Mendikdasmen), Abdul Mu'ti, as quoted from an online media source, that the Ministry will include artificial intelligence (AI) and coding in the school curriculum starting next semester or the 2025/2026 academic year. AI and coding are not compulsory subjects, but elective ones. Both will be offered as elective

subjects starting from grade 5 of elementary school through junior secondary school. It is understood that the preparation referred to includes the issuance of a new Ministerial Regulation on Primary and Secondary Education (Permendikdasmen), which will be released after the Ministry of Law provides its analysis on the alignment of the curriculum with legal aspects. So, for now, the process is still in the harmonization stage at the Ministry of Law.

Thus, the ideal concept of the policy direction for intelligent technology education (robotics, coding, artificial intelligence) includes:

1. Strengthening regulations and learning outcomes:
    a. Revising regulations regarding curriculum structure to include Coding and Artificial Intelligence as an elective subject at each educational level.
    b. Formulating and aligning the learning outcomes for the Coding and Artificial Intelligence subject to be consistent with the learning outcomes of Informatics.
2. Development of Learning Resources and Teacher Training
    a. Develop core textbooks and teaching materials for the Coding and Artificial Intelligence subject.
    b. Conduct intensive training for elementary school teachers who are potential instructors of the Coding and Artificial Intelligence subject.
    c. Provide training for Informatics teachers at the junior secondary, senior secondary, and vocational school levels on teaching Coding and Artificial Intelligence.
    d. Optimize the use of Learning Management Systems (LMS) to support widespread and sustainable teacher training.
3. Certification and Strengthening of Teacher Competency
    a. Provide certification programs for Coding and Artificial Intelligence teachers to enhance their competence and professionalism.

b. Revise regulations regarding the alignment of subjects with teacher certification by adding Coding and Artificial Intelligence as a recognized field.

4. CONCLUSION AND RECOMMENDATION

1. Conclusion

Intelligent technology education is currently provided through non-formal education. In response, the Government through the Ministry of Primary and Secondary Education has issued the Academic Paper on Coding and Artificial Intelligence Learning, with a policy direction toward revising the National Education System Law (UU Sisdiknas). This serves as the ideal concept for preparing the integration of intelligent technology education (robotics, coding, artificial intelligence) into the national education curriculum, aiming to ensure legal certainty and justice for non-formal educators.

2. Recommendations

The intelligent technology curriculum (robotics, coding, artificial intelligence) needs to be implemented at all school levels to support the transition from the Industrial Revolution 4.0 to the Society 5.0 era. This requires a legal basis to ensure legal certainty in its implementation.

REFERENCES

Indonesia, *Undang-Undang Republik Indonesia tentang Sistem Pendidikan Nasional*, UU No. 20 Tahun 2003, Pasal 2 dan Pasal 3.

Bambang Hermanto, "Perekayasaan Sistem Pendidikan Nasional Untuk Mencerdaskan Kehidupan Bangsa", *Foundasia*, Volume 11, Nomor 2, 2020, hlm. 52-59.

Sabaruddin, "Pendidikan Indonesia dalam menghadapi era 4.0", *Jurnal Pembangunan Pendidikan: Fondasi dan Aplikasi*, Vol. 10, No. 1, (2022): 43-49.

Adiansah, W., Setiawan, E., Kodaruddin, W. N., & Wibowo, H. (2019). Person In Environment Remaja Pada Era Revolusi Industri 4. 0. Jurnal Pekerjaan Sosial, 2(1), 47–60.

Sri Sudarsih, "Pengembangan Ilmu Pengetahuan dan Teknologi di Indonesia Berdasar pada Nilai-Nilai Kemanusiaan yang Adil dan Beradab", *Jurnal Kajian Hukum, Budaya, Perpustakaan dan Informasi*, Volume 8, Nomor 2, 2024.

Philip, H. Coombs, dalam Soeleman Joesoef, Konsep Dasar Pendidikan Non-Formal, (Jakarta: Bumi Aksara, 1992), hlm. 50.

Fanky Christian, "Pentingnya kurikulum robotik untuk hadapi industri 4.0", terdapat disitus https://www.aptiknas.id/2018/11/pentingnya-kurikulum-robotik-untuk.html, diakses pada tanggal 11 Agustus 2025, pukul 17.33 WIB.

T. K. F. Chiu, "A Holistic Approach to the Design of Artificial Intelligence (AI) Education for K-12 Schools". TechTrends, 65, 2021, 796–807. https://doi.org/10.1007/s11528-021-00637-1

Indonesia Proud, "Jully Tjindrawan: Pendiri Lembaga Kursus Robotik & Rumah Robot Pertama di Dunia", terdapat disitus https://indonesiaproud.wordpress.com/2010/12/13/jully-tjindrawan-pendiri-lembaga-kursus-robotik-rumah-robot-pertama-di-dunia/, diakses pada tanggal 11 Agustus 2025, pukul 21.10 WIB.

Sodiq A, Kuntoro, Pengembangan Paradigma Baru Keilmuan dan Kelemb

E. Nasution, "Problematika Pendidikan di Indonesia", Jurnal Fakultas Ushuluddin Dan Dakwah IAIN Ambon, Volume 2, Nomor 1, 2019, hlm. 10.

M. Suryaman, "Pengembangan Kurikulum Merdeka Belajar Program Studi Pendidikan Bahasa Indonesia. Prosiding Seminar Daring Nasional: Pengembangan Kurikulum Merdeka Belajar, Volume 1, Nomor 3, 2020, hlm. 28.

Kementerian Pendidikan Dasar dan Menengah Republik Indonesia, Naskah Akademik Pembelajaran Koding dan Kecerdasan Artifisial Pada Pendidikan Dasar dan Menengah, Pusat Kurikulum dan Pembelajaran & Pusat Standar dan Kebijakan Pendidikan Badan Standar, Kurikulum, dan Asesmen Pendidikan Kementerian Pendidikan Dasar dan Menengah Republik Indonesia, Februari 2025.

Dede Leni Mardianti "Alasan Kemendikdasmen Ingin Pelajaran AI dan Koding Masuk RUU Sisdiknas", terdapat disitus https://www.tempo.co/politik/alasan-kemendikdasmen-ingin-pelajaran-ai-dan-koding-masuk-ruu-sisdiknas-1633164, diakses pada tanggal 11 Agustus 2025, pukul 18.07 WIB.