

EAJ Report 2025-01

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Research Project on Engineering Ethics and Engineering Education for Future to Come



August 2025

The Engineering Academy of Japan
Research Project for “Engineering Ethics and Engineering
Education for Human Security and Well-being”
(Project Leader: Hideaki Koizumi)

August 21, 2025

The Engineering Academy of Japan

The Engineering Academy of Japan (EAJ) is a non-profit, non-governmental organization established for the purpose of contributing to the advancement of engineering and technological sciences in Japan. Its members are engineering leaders in industry, academia, and government. The EAJ has several project teams that seek to find solutions for issues by fully utilizing its broad network and the abundant experience and knowledge of EAJ members. With these project teams playing a core role, the EAJ undertakes investigation and proposal activities and also collaborates with external people and organizations. The EAJ reports on the outcomes of its activities; proposes leading-edge and creative policies for the future direction of society to public agencies, legislative bodies, industry, academic societies, and research institutions; and supports the societal implementation of these proposed policies.

The EAJ's research project on "**Engineering Ethics and Engineering Education for Future to Come**" addressed the topic of new "Engineering Ethics" that will enable "Human Security and Well-being" and new "Engineering Education" for its societal implementation from an interdisciplinary and transdisciplinary perspective. The goal is to realize a society where humanity and nature truly coexist in an uncertain future that faces mounting global challenges and to identify which measures the EAJ should undertake. Our team drafted a report summarizing the results, which was reviewed by the Policy Proposal Committee and examined by the Council of EAJ prior to being finalized. Only then did the Council of EAJ decide to release the final version of this report. We hope you find it informative and useful.

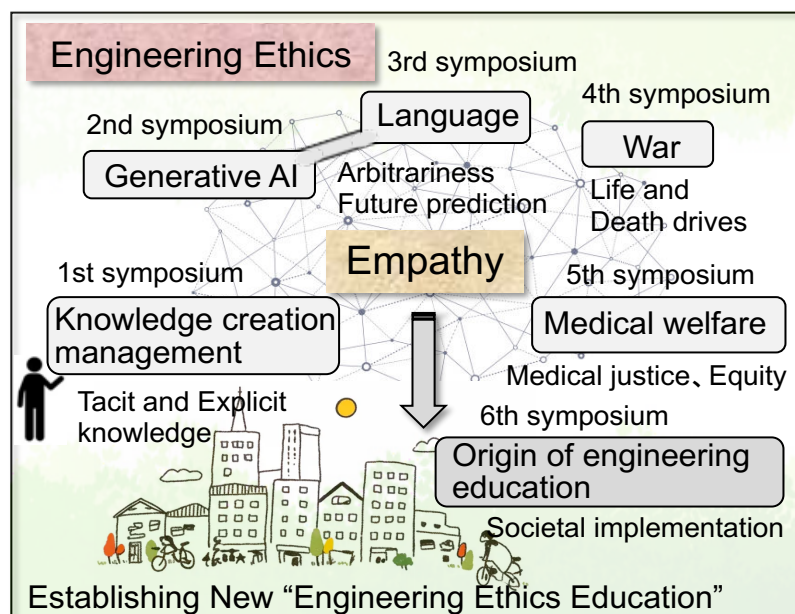
This report summarizes the results of the research project “Engineering Ethics and Engineering Education for Future to Come” that was conducted with support from the Watanabe Memorial Foundation for The Advancement of New Technology. Below is a list of project members. The affiliation is as of August 21, 2025.

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Summary

Engineering creates human artifacts, bringing both benefits that enrich human society (Lights) and challenges that pose societal and national risks (Shadows). As a branch of applied ethics, the discipline of engineering ethics establishes standards of behavior and moral principles governing how each individual involved in engineering should act within their profession, considering the social implications of technological advancement with the aim of contributing to human security and well-being. The EAJ project was organized by people from diverse academic fields, extending from the natural sciences to the humanities and social sciences. It has held periodic hybrid symposiums to engage in deep discussion on future-oriented engineering ethics and engineering education, each of which has attracted approximately 100 to 150 participants. Each symposium featured a specific topic with invited experts as the keynote and special speakers and experts giving trans-disciplinary (TD) talks. A video record of each symposium was made available on the EAJ project website for one year following each event. The outcomes are summarized and illustrated below.

At the kickoff symposium, the late Prof. Emeritus Ikujiro Nonaka of Hitotsubashi University delivered a keynote lecture on “The Knowledge Creation Theory,” addressing “Challenges in Engineering Ethics on Site.” It discussed how ethics is extremely important in corporate management and that its basis lies in empathy. It also proposed tacit subjectivity as the source of knowledge. In this theory, the tacit knowledge of individuals is transformed into explicit knowledge through direct experience of the “Now and Here,” mediated by empathy with others. It is then shared and aggregated into collective knowledge with others. Explicit knowledge shared within the group is subsequently reabsorbed into individual tacit knowledge by being put into practice. Human nature contains contradictory concepts such as good and evil or the ideal and the actual, causing friction both within and between individuals. However, these contradictions are not obstacles, rather, they are essential for creating knowledge and putting it into practice. The process of bringing two such contradictory concepts together to create something new is called the dialectical method. Integrating such contradictory concepts is crucial to achieving the common good.



Overview of the series of symposia.

The second symposium featured keynote lectures by Professor Yutaka Matsuo of The University of Tokyo and Professor Yoshikazu Nakajima of the Tokyo Medical and Dental University (now known as the Institute of Science Tokyo) on the topic of “Generative AI and Ethics.” Concerns were raised about the reliability and safety of generative AI due to misinformation and bias. Since these issues may relate directly to the arbitrariness of human language, the discussion explored a new perspective of deepening human ethics through generative AI’s ethics.

The third symposium featured keynote lectures on the topic of “Language and Ethics” by Specially Appointed Assistant Professor Satoru Nemoto of Risho University and Kazuo Okanoya, a professor emeritus at both Teikyo University and The University of Tokyo,. These explored how the nature of human language connects to ethics through a discussion of human language in the Heian period and the evolution of human language. Predicting the future is an inherent characteristic of human language because of the potential for high predictability to increase survival probability. Generative AI represents a significant advance from the formal language of computers toward natural human language. This means that, through language, generative AI may even have the potential to conceptualize the shape of the future. Furthermore, as highlighted at the second symposium, generative AI’s acquisition of the ambiguity characteristic of human language prompts concern about it fostering prejudice and discrimination, spreading misinformation, and infringing on personal information issues, all of which relate to the arbitrariness of human language. This suggests a new approach in which human language itself, through large-scale natural language processing models like generative AI, has a deep relationship with the nature of ethics. Humans use language to standardize and generalize their internal world (their “mind”), using it to connect to the external world and to enable sharing with others. Furthermore, the theory of mind allows humans to consider others’ perspectives and imagine their internal worlds. However, this brings a high risk of introducing bias into society, making ethics absolutely essential.

The fourth symposium invited Professor Shigeo Uno of The University of Tokyo to give a keynote lecture and Professor Hisashi Owada, a former president of the International Court of Justice, to present a special lecture on the topic of “Ethics and Law in War.” The discussion centered on the morality and ethics of individuals and nations, with war being seen as due primarily to human instincts. According to Freud’s psychoanalytic theories, humans possess the duality of “Life Drive” and “Death Drive,” although cultural development offers the potential to control these drives. In the *Leviathan* by Thomas Hobbes, the state is seen as a monster, controlling society and leading it to war. That is, it cannot be explained by ethics at the individual level alone but rather it is vital that ethical considerations be addressed at the state level.

At the fifth symposium, Professor Kiyohiro Hokin, President of Hokkaido University, gave a special lecture and Professor Toshiro Ohashi of Hokkaido University gave a keynote lecture on the topic of “Medicine and Ethics.” The discussion addressed medical ethics, in particular “Equitable Distribution of Medical Resources” and “Life Extension and Enhancement.” These were considered in terms of the “Four Principles of Medical Ethics,” namely respect for autonomy, beneficence, non-maleficence,

and justice (fairness). While each principle is ethical in its own terms, they can sometimes create mutually contradictory relationships. That is, considered holistically, it is difficult for all four principles, as expressed in practice, to simultaneously fulfill ethics as an ideal. A future-oriented medical ethics capable of addressing advanced medical technologies is now required.

Finally, recognizing that realizing “Human Security and Well-being” requires shifting the focus to engineering education as a means of societal implementation so as to sublimate specialized individual knowledge into the collective knowledge of the entire nation, the sixth symposium on the topic of “The Origin of Engineering Education” was held to examine how, from early childhood, it forms the foundation of life. The keynote lectures were delivered by Professor Gentaro Taga of The University of Tokyo and Professor Masato Yasui of Keio University, drawing on the latest findings in brain science indicating that ethical values and empathy may begin to develop at a very young age to focus on engineering ethics education during early childhood. The sixth symposium represented both a milestone in this research project and a starting point for building new methodologies for engineering ethics education as a means of putting ideas into practice. From this series of symposia, the following new proposals were developed for a future-oriented approach to “Engineering Ethics and Engineering Education.”

- I. A shift from “Human-centered Engineering Ethics” to “Nature-centered Engineering Ethics.” Specifically, this proposes that engineering ethics be reconstructed on a basis of an empathy that allows us to deeply feel and understand the entire ecosystem, comprising living and non-living entities and their interactions.
- II. A reconstruction of engineering ethics through a transdisciplinary approach that spans the humanities, social sciences, and natural sciences.
- III. That realizing “Human Security and Well-being” calls for a deep understanding of the human condition, namely, “Language,” “Life and Death Drives,” and “Desire for Life,” one that acknowledges a context that includes wars that threaten human survival, generative AI that represents a similar threat, and medicine that involves the manipulation of human life.