

Practice of Cross-Disciplinary Cooperative Liberal Arts Education in Engineering Education

Hana Kaneko*, Yasuyuki Nakamori, Mutsuko Hieda,
Daisuke Nakamura and Shotaro Iwauchi

Toyohashi University of Technology / Institute of Liberal Arts and Sciences, Toyohashi City, Japan

Hana Kaneko* (kaneko@las.tut.ac.jp)

Since its founding, Toyohashi University of Technology has consistently placed emphasis on liberal arts education in its engineering education. In response to the recent changes in the characters of students and the required competencies of engineers, TUT established a new subject called “Introduction to Liberal Arts” in 2024.

This study introduces and examines the pedagogical approach used in this subject.

“Introduction to Liberal Arts” is a two-credit cross-disciplinary basic subject for first-year students, comprising 15 half-term classes. It is an elective subject (enrolment rate of approx. 95%) which is divided into 4 classes (a-d) with a maximum capacity of 20 students per class.

“Introduction to Liberal Arts” is not just an omnibus class. This is a completely new class in which “guest teachers” from different fields participate in the classes of the “responsible teachers” who supervise each class, and various “dialogues” are attempted.

For example, the author did the following in Class (b). Class (b) is a class in which experts from various fields approach the keyword “create” from their own perspectives, and based on this, students and teachers engage in dialogue with each other. Throughout the 15 weeks, the students can experience through dialogue that there are many different perspectives and approaches to the concept of “create”, depending on the field.

The author set the theme of “Creating Haiku”. This is not a class where engineering students simply create Haiku. While they experience that the act of creating new materials, creating new Architecture, creating new programs, etc., and the act of creating new Haiku are different experiences, they can also realize that all of these acts have something in common.

Technology is something used to make people happy. Therefore, engineers must have a good understanding of what people are seeking in life and when people feel happy. This mindset is the same as that of a person who is “creating” a Haiku. Furthermore, through dialogue, they experience the similarities and differences between their own senses and those of others.

This kind of experience raised the students' motivation and greatly improved their learning, resulting in higher learning effectiveness. This is supported by the responses from the students' subject evaluation questionnaires and the observation of the students' behavior during the class. It is also worth noting that the teachers in charge experienced immense fulfillment throughout the classes.

Keywords: liberal arts, engineering education, create, Haiku

Introduction

Toyohashi University of Technology (hereinafter referred to as “TUT”) is a single-faculty university specializing in engineering that was established in 1976. Since its inception, TUT has consistently emphasized liberal arts education. The reasons for this are mainly twofold.

First, it stems from TUT's founding philosophy and educational objectives. The investigative committee established to prepare for the establishment of TUT and Nagaoka University of Technology outlined in its report (“A Proposal for a New Graduate School of Science and Technology,” 1974) that the type of talent TUT sought to cultivate was “highly skilled engineers who possess the general knowledge, qualities, and basic technical sensibilities necessary to serve as leaders in organizations.”

The second reason lies in the characteristics of our students. At the time of TUT's establishment, the target students were “graduates of college of technology (KOSEN) or those with equivalent technical skills and academic abilities” (ibid.), and currently, 80% of our students are graduates of KOSEN who transfer in the third year of TUT. In the curriculum of KOSEN, a significant portion of class time is allocated to specialized subjects, leaving limited time for liberal arts education. As a result, while students acquire excellent specialized technical skills, they inevitably tend to lack knowledge and literacy outside their specialized fields (though individual abilities vary). In fact, faculty members who interacted with third-year transfer students at TUT's inception noted that they exhibited characteristics such as “uncertainty in basic knowledge,” “lack of interest in

people and society,” and “judging based on short-term effectiveness” (“Toyohashi University of Technology Ten-Year History,” 1986). Among these, the third characteristic, “judging based on short-term effectiveness,” is attributed to the experience gained during their time at KOSSEN, where students were “driven to learn technology without cultivating an attitude toward unfamiliar things or even feeling curiosity about them.”

In other words, in order to cultivate engineers with the “general education and qualities suitable for leaders of an organization” that TUT aims to produce, it was deemed essential to enhance general education. As a result, TUT has incorporated many general education subjects into the third-year curriculum for students transferring from KOSSEN and has also implemented general education for graduate students.

A faculty organization dedicated to liberal arts education, the “Humanities and Social Engineering Department,” was also established. In 2010, this department was reorganized into the “Institute of Liberal Arts and Sciences,” which is responsible for liberal arts education across the fields of humanities, social sciences, and natural sciences. During this period, TUT’s founding philosophy of “cultivating not merely technical human resources, but “cultivating humanistic engineers” (“ Toyohashi University of Technology Ten-Year History”) was maintained. However, in response to global social changes, rapid technological advances, and changes in the characteristics of incoming students, a review of educational content was conducted within the organization, centered on the ‘Liberal Arts Education Review Team’ established in 2019. This movement expanded to the entire university the following year, and TUT’s fourth medium-term plan clearly stated the goal of “Reconstructing liberal arts education appropriate for the future of science and engineering education that integrates the arts and sciences.” Thus, a comprehensive review of liberal arts education at TUT and Institute of Liberal Arts and Sciences began in earnest (Nakamori, 2025).

Through lectures and faculty development workshops on liberal arts, as well as interviews with faculty members both inside and outside the university, we worked to understand the current state of liberal arts education. The most time-consuming discussion was about the current disposition of TUT students and the abilities we want to cultivate in them. The results are shown in the Table1 below.

Table 1. Current temperament of TUT students and abilities to be cultivated

Temperament of students	Abilities to be cultivated
Becoming more introverted while keeping in mind the image of engineers demanded by society	Dreams, Self-esteem
Efficiency-oriented, Results-oriented	Problem-solving skills, Willingness to devote time to tasks
Strong fear of expressing subjective opinions and having them rejected	Sensitivity to shared joy
Narrow interests and perspective	The courage to leave one's comfort zone
Weak ability to organize thoughts, and a negative view of this	Recognition of the importance of time to think deeply, Ability to organize opinions

Based on the above, the Institute of Liberal Arts and Sciences has formulated a new philosophy for liberal arts education. It is as follows.

The Institute of Liberal Arts and Sciences aims to nurture engineers who can engage in dialogue toward their dreams.

The seeds of technology lie within everyday life. Our goal is to cultivate engineers who, as citizens, can nurture sensitivity to diversity and universality, empathize with human frailty and anxiety, identify underlying issues, and solve them with perseverance and kindness.

To realize the above educational objectives and philosophy, a new first-year course titled “Introduction to Liberal Arts” has been established. The following sections will provide a detailed description of the course’s characteristics and specific examples of classroom practices for the 2024 academic year.

Pedagogy

“ Introduction to Liberal Arts” is a 2-credit ‘interdisciplinary foundation course’ consisting of 15 classes in the first semester. It was offered as a first-year course rather than a third-year course because it was the best option given the limited number of faculty members and class hours available. At the same time, it was designed to cultivate students’ sensitivity to diversity and universality and to equip them with the abilities necessary for dialogue before they begin studying their specialized fields. Additionally, there is an expectation that these first-year students, when they join students from KOSSEN in their third year, will provide a positive stimulus for the latter.

Although it is an elective course in the curriculum, the enrollment rate for the 2024 academic year was approximately 95%, meaning that virtually all first-year students took the course. To facilitate close communication between faculty and students, class sizes were limited to 20 students. Approximately 80 first-year students are divided into four classes (a–d) for instruction.

The course involves multiple instructors from different fields, but it is not simply an omnibus course. Each class is supervised by a single instructor, but several of the 15 classes are taught by guest teachers. The supervising instructor is also present in the classroom to listen to the guest teacher and occasionally ask questions. In this environment, classes proceed with free dialogue among faculty members, between faculty members and students, and among students.

Here is a brief explanation of the content of each class. First, class (a) is centered on a class on “philosophical

dialogue” (Iwauchi, 2025). “Philosophical dialogue” is a dialogue in which multiple participants gather to form a certain common understanding or agreement on questions that do not have easy answers. The dialogue in class (a) as an “Introduction to Liberal Arts” was conducted with the aim of cultivating “negative capability” (the ability to endure situations that cannot be resolved) and the ability to build consensus with others who are different, based on lectures by guest teachers and discussions exploring the essence of concepts such as “culture,” “language,” “cognition,” and “technology.”

Class (b) is a course with the theme of “creating” (Okada, 2025). The classes taught by responsible teacher and guest teachers consist of one “lecture” and one “practical” session, with the “practical” session involving students attempting to actually “create” what they learned in the lecture. The lecture content covers a wide range of subjects, including physics and electronics engineering, which are responsible teacher's areas of expertise, as well as materials science, Japanese literature, law, and English poetry and American literature. In the practical sessions, students engage in dialogue with one another while working on tasks such as recreating molecular structures using models, composing Haiku or English poems, creating court precedents, and constructing paper models of satellite components.

Class (c) is a course on the theme of “reading images” (Nakamura, 2025). The course is structured to help students understand the key points of analyzing and appreciating images by learning filmmaking techniques. In addition, lectures on how to utilize the library and academic writing are held (jointly with class (d) described below), allowing students to acquire skills that can be applied to research and thesis writing. Compared to other classes, this class has more lecture time, making it easier for students who are not good at discussion to participate.

Class (d) focuses on the theme of “gender” (Hieda, 2025). Students engage in dialogue about gender issues occurring in familiar settings such as within the university, and through lectures by guest teachers, they are exposed to concepts of gender in literature and economics. The goal is to help students recognize gender issues from diverse perspectives and contribute to society with a broader outlook.

Below, we will explain the specific practices implemented by the author in class (b) and their educational effects. The author conducted two classes as a guest teacher, setting the theme of “creating Haiku.” This was not simply a class intended to have engineering students write Haiku. Rather, it was intended to help students realize that the act of creating Haiku is a different experience from the technical acts of creating new materials, building new houses, or developing new programs, while also making them aware of the commonalities between these acts.

In the first class, the author explained to the students what Haiku is. Haiku is a form of literature that aims to convey one's feelings to others within the constraints of 17 syllables and the mandatory use of a seasonal word. Therefore, it is important to create works that others can empathize with or be moved by, rather than works that

are self-indulgent. After ensuring that the students understood this, the author instructed them to write three Haiku each by the next class.

In the second class, the author had the students submit all the Haiku they had written and held a Haiku gathering. This Haiku gathering was conducted in accordance with the formal methods used in general Haiku societies, following the steps below.

1. Students were asked to copy their Haiku onto “Tanzaku” (long strips of paper) without writing their names.
2. All “Tanzaku” were collected, shuffled, and distributed to each student in sets of three.
3. Distribute “Seiki Yōshi” (fair copy sheet, one sheet per person) and have the students copy the Haiku written on their short strips onto “Seiki Yōshi”.
4. Arrange the desks in a circle and have the students sit down. Have each student write their Haiku name on a piece of paper and display it so that other students can see it.
5. Distribute “Senku Yōshi” (selection sheet, one per person). Have students read the “Seiki Yōshi” in turn, select five works they like, and write them on the “Senku Yōshi.” From those five, select the best one and designate it as the “Tokusen” (special selection).
6. Have each student read aloud their “Tokusen”. At this point, the author of the selected Haiku must announce his/her Haiku name to everyone to confirm that it is his/her work. The student holding the “Seiki Yōshi” with the “Tokusen” written on it then says, “Itadakimashita (I have received it),” and writes the author's name and score count below the Haiku on the “Seiki Yōshi”.

The purpose of steps 1–3 is to completely obscure the authorship of the Haiku, ensuring that students are not influenced by the authors' information when selecting the best Haiku.

The students approached both Haiku composition and the Haiku gathering with serious dedication. In particular, during the announcement of the “Tokusen” in step 5, everyone was visibly excited and tense with anticipation.

Figure 1. Scene from a Haiku gathering



After the class, all students were asked to submit a report. The report included the Haiku they selected as their “Tokusen” and an explanation of why they chose it. Students were also instructed to write comments on any

other Haiku that resonated with them. The author compiled the results and provided feedback to the students.

Results and Discussion

The main comments given by students in their reports for selecting “Tokusen” were as follows.

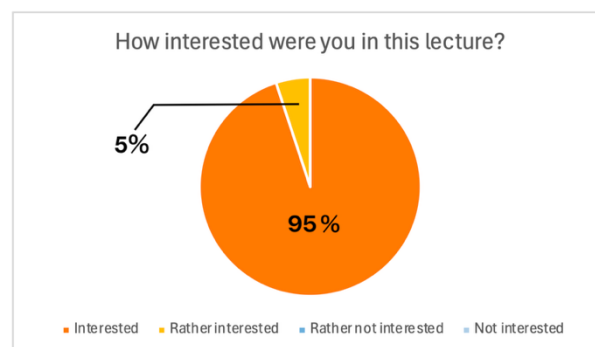
1. “It conjures up images of the scenery” or “It stimulates the imagination.”
2. “I can relate to it.”
3. “Reading it brought back childhood memories and made me feel good.”
4. “I thought it was interesting that I couldn't come up with such wording myself,” “It's amazing that you can express that scene in 17 characters,” “The rhythm is good, and it was fun to read,” “The use of seasonal words is good.”

First, in 1, it is clear that by reading other people's Haiku, the students are reimagining the world of the Haiku, which is the experience of others, as their own mental landscape (re-experiencing it). In 2, the reader feels that others share the same emotions as themselves, and their heart is moved. In 3, reading another person's Haiku awakens the reader's own past experiences and emotions. At the stage of writing the report, the reader consciously reinterprets those experiences and emotions from their current perspective. In 4, the reader is sincerely moved by the language expression of another person that they themselves could not have used before.

In this way, students recognize through exposure to others' works that there are commonalities between their own hearts and those of others, or conversely, that they are exposed to sensibilities they did not previously possess. Furthermore, it becomes clear that when their own hearts are moved, they perceive the work as a “good Haiku.” In other words, through the experience of creating their own Haiku and appreciating others' works, students are believed to have gained a deeper understanding of the inner workings of the human heart in everyday life.

Responsible teacher of class (b) conducted a survey after the end of the first semester to ask students in class (b) for their impressions of all classes (See Graph 1).

Figure 2. Results of a survey of students who took “Introduction to Liberal Arts” (b) (1) : Level of interest in classes



In response to the question, “Did you find this lecture interesting or engaging?”, out of 20 valid responses, 19 selected the top-ranked response (“Yes, I found it interesting or engaging”), and 1 selected the next-highest response (“Somewhat interesting or engaging”). No students selected the lower-ranked response (“Somewhat uninteresting or unengaging”) or the lowest-ranked response (“Not interesting or unengaging”).

In response to the above question, the following answers were given to the open-ended question asking for reasons.

- I am a future engineer, so I feel that the word “create” is closely related to me.
- I thought that thinking about what it means to “create something” would be useful in the future.
- Until now, when I heard the word “create,” I imagined making something tangible, but I was surprised to learn that literature and law also involve “creation,” which I found interesting.
- Even in fields I was not interested in, I found the professor's explanations interesting.

These responses highlight that this course broadens students' interests and provides an opportunity to consider the essence of creative behavior.

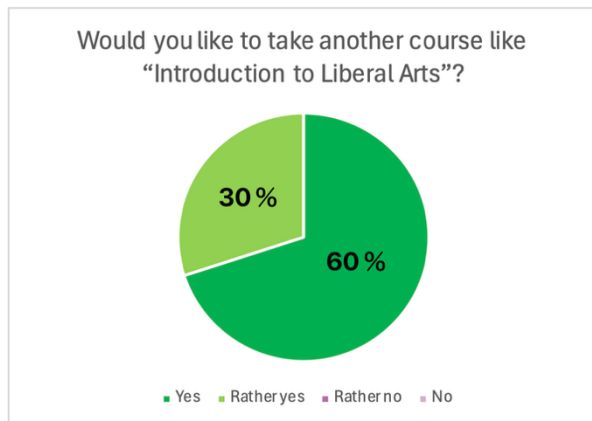
Furthermore, when asked about changes in their way of thinking after taking this course, students responded as follows:

- I realized that my way of thinking is limited to my own perspective.
- I want to learn from other people's ways of thinking.
- I realized the importance of communication.
- I realized that “creating” includes evaluating works and improving them based on various opinions.
- I learned that listening to the opinions of others and cooperating with them leads to better results.

These responses show that through group work and mutual evaluation in this class, students realized the importance of dialogue and cooperation.

Furthermore, the results for the question “Would you like to take another course like ‘Introduction to Liberal Arts?’ ” were as shown in Graph 2.

Figure 3. Results of a survey of students who took “Introduction to Liberal Arts” (b) (2) : Whether students would like to take courses such as “Introduction to Liberal Arts” again



Of the 20 valid responses, 14 were the highest-ranked response (“I would like to take it again”) and 6 were the next highest-ranked response (“I would rather take it again”). No students selected the lower-ranked response (“I would rather not take it again”) or the lowest-ranked response (“I do not want to take it again”).

In addition, the faculty members involved in “Introduction to Liberal Arts” also felt encouraged by the students' responses and the results of the course surveys and experienced a great sense of fulfillment through the course. For example, based on the above survey results, responsible teacher commented, “I believe that the intentions of those who created ‘Introduction to Liberal Arts’ were conveyed to the students” (Okada 2025).

Conclusions

Through the practical exercise of writing Haiku in this class, the students learned the differences and similarities between the creativity of engineers and the creation of Haiku. Technology creates concrete things that are useful to human life, such as new materials, buildings, and programs, while Haiku conveys the movements of one's heart to others through words and enriches the hearts of others. This is where the difference in approach between technology and Haiku (literature) lies. However, both share the same ultimate goal: to create something that brings happiness or joy to people.

Therefore, engineers must have a deep understanding of what people seek in life and the nature of the human heart. This is the same as “creating” Haiku. Through composing Haiku and appreciating others' Haiku, the students experienced the differences and similarities between their own perceptions and those of others. We believe this experience has the potential to serve as a foundation for the students' future technological development.

Additionally, such experiences have enhanced students' motivation and significantly improved learning outcomes. This is supported by responses and comments in students' course evaluation surveys, as well as observations of their behavior during classes. It is also worth noting that the instructors involved reported a strong sense of fulfillment from the course.

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