

Mentoring Program for Training of Professionals: A Case of Graduate School of Engineering Research

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Abstract

In spring 2005, Graduate School of Engineering Research, Osaka University submitted a mentoring program for training professionals to the “Attractive Graduate School Education” initiative (2005-2006) of the Ministry of Education, Sports, Culture, Science & Technology (MEXT). The aim of the program was to carry out a joint program between academia and industry to support career development at graduate schools. The proposal was subsequently selected as a program involving a mentor system to improve execution skills and PB leader training. And this program was implemented from November 2005 to March 2007. Even after the “Attractive Graduate School Education” initiative was over, this program was continued in the Engineering Research Department of Osaka University. This social experiment at Osaka University is worthy of mention as Japan’s , as long as the authors know, first full-fledged mentoring program to educate engineers and technicians.

Keyword

Mentoring Program PB (Project based) leader training program evaluation Multi-facet Performance Index

Background

The relationship between science & technology and society is experiencing rapid complexity, sophistication and internationalization as problems concerning the global environment increase in seriousness. Given these developments, it is essential and urgent for industry to train human resources in technical fields who have technical developmental strengths, communication skills, management skills, leadership skills and well-developed human qualities. With these burgeoning needs in modern society, institutions of higher learning that train technicians for different fields are strongly challenged to create new educational systems that can support promotion of higher education in engineering fields and the career support systems characterized by cooperation between industry and academia with the universities as the base point.

Outline of Program

The “mentees” in this program (the word “mentee” and not “protégé” is used in this program) are graduate students in engineering fields. The “mentors” are researchers and technicians active on the front lines of society, such as at enterprises or research institutions. Mentoring activities are an opportunity for mentees to receive direct and continuous guidance and assistance on a one-to-one basis from their mentors in creating their master’s and doctoral theses as well as in research and career design. In addition, by experiencing actual research and activities carried out by their mentors and by observing them from the side, so to speak, they can experience a “hands-on” approach in learning how to promote projects as well as management or R&D in technical fields.

Viewed from a global perspective, this program has the following unique characteristics: (1) Progressive, (2) Training of technicians through a tie-up between industry and academia having institutions of higher learning as the base point, (3) A scheme in which the guiding instructors act as go-betweens, (4) Career development support for science & engineering students with emphasis on research guidance, (5) Two-stage program that includes PB (project based) leader training in collaboration with the mentoring system.

Although a structure in which the mentors are scouted among persons active in society outside the university (such as in private enterprises, universities, research institutions) is already general practice in the West, it can still be called very progressive in Japan. With this structure it is possible to obtain talent in a wide range of fields to act as mentors, such as project promotion leaders, persons engaged in systems research, technicians in artisan fields, researchers in international cooperation projects, consultants, venture business entrepreneurs, etc. This allows varied and appropriate matching of mentors with mentees in developing the programs. In addition, not limited simply to acquiring specialized knowledge and skills in technical fields, it has promoted acquisition of social and practical skills that are difficult to acquire in academic programs at the universities. These include management skills, international communication skills, abilities involving the human factor and abilities to respond skillfully to various social situations.

Another unique aspect of the program is creation of a training structure that also includes PB leader training system as an accompanying element. The mentor system has as its target graduate students now enrolled in master’s degree programs or higher. The emphasis is on guidance and assistance regarding theses and research assistance as well as career design. Although the system emphasizes career development assistance, the PB leader training system allows participants to engage practically in projects in order to learn project management and other skills in a system that aims to raise up the next generation of leaders equipped with the necessary practical skills. It has thus

been developed with the main target on students in doctoral programs. The two stages of the “mentor system” and “PB leader training system” aimed at improving practical abilities such as abilities to respond to various social situations, practical abilities, abilities involving the human factor, international communication skills and interdisciplinary intelligence.

About 30 mentors were selected from research institutes, government organizations and private industry, while mentees were about 30 persons who are graduate students specializing in environment and energy engineering fields. As for PB leader training, we obtained overseas basis in the Asia region to establish cooperative relationships with local researchers there.

The mentees were expected the following advantages from this program: (a) The chance to learn the stance of mentors toward their work and their human qualities, (b) Obtaining guidance directly in touch with society’s needs in preparing research papers, (c) Being able to experience research and actual activities overseas, (d) Chance to deepen practical understanding about technical development and research, (e) Chance to learn project forwarding technology and management methods, (f) Possibility of broadening career possibilities as a technician. More concretely, the following goals were cited: (1) Learning stance toward one’s research and the “soul” of the researcher, (2) Obtaining guidance and learning strategies directed toward the future, (3) Deepening practical understanding, (4) Learning knowledge and skills firsthand on the job, (5) Obtaining career paths. The mentors, for their part, hoped for the following advantages: (1) Joy of brining one’s experience to bear in education, (2) Handing down research themes and other aspects to the next generation of researchers, (3) Recruiting of outstanding students with the right skills and abilities, (4) Feedback toward one’s own work, etc.

Regarding the universities and majors, which operate the program, elements such as the following were envisaged: (1) Possibility of promoting academic reforms, (2) Feedback from industry, (3) Possibility of promoting research, (4) Creating a network of alumni. And in terms of the special characteristic of its being a program with the university as the base point, high schools and the local society envisaged the following points as their merits: (1) Arousing interest in proceeding to higher education, (2) Obtaining advisors and counselors (while reducing worries about one’s future), (3) Experiencing the university first-hand. The program organizers aimed for a management in which it would be possible to enjoy these various benefits.

Contents and Processes

Actual mentoring activities started in February 2006. Preparations began prior to this, however, in the fall of 2005, with creation of systems for secretariats, etc. A “kickoff lecture presentation” was

staged in November 2005 as concrete preparations started, such as canvassing for mentors and mentees.

Those wishing to become mentees were required to submit a “plan” in which they expressed their hopes regarding the mentoring activities such as the skills and experiences they wished to gain via the program, in addition to saying which mentors they would like to be paired with. This was the basis for screening/matching of mentors and mentees by a promotional unit. After deciding on pairs, the respective mentoring activities began.

Mentoring was basically developed on a face-to-face basis, although exchange of e-mails was carried out when necessary to make adjustments in mentoring dates and times.

After start of the mentoring activities, lectures, mentee experience report meetings and more convivial meetings were held at regular intervals. Regardless of whether they were participating in the activities or not, students, faculty, employees of research institutes and secretariat staff were enlightened on the program and encouraged to understand the program as needed. Such occasions of exchange of opinions and other forms of exchange were beneficial in developing relations of mutual trust.

In addition, a “MENTORING NEWS” was released once a month as a medium for dispensing information so as to inform persons on the campus about the program while encouraging understanding, pooling the experiences and results of mentoring activities, and informing society on a wide basis of such progressive endeavors.

Role of the Secretariat

The program was run by a so-called program forwarding unit consisting of six full-time faculty members, five part-time faculty members and two secretariat assistant. The “secretariat” in terms of operations was composed of the part-time faculty and secretariat assistant. A network was also created with outside experts to support mentoring and student career development in thus maintaining a cooperative system.

This program has been developed with a unique scheme by which the secretariat supports the mentoring relationship between mentors and mentees, and guiding faculty intervene and mediate (see Figure 1).

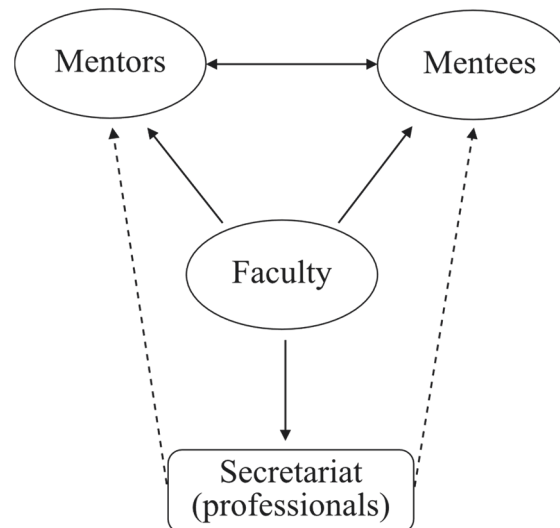


Figure 1: Mentor System Scheme at Osaka University

The mission of the secretariat is to promote good relations between good-willed mentors and mentees with prospects for the future. It thus acted in good faith to support the program objectively.

More concretely, public relations of the program, canvassing and certification of mentors and mentees, matching (pairing), monitoring of mentoring activities of pairs and results measurement for program evaluation were planned by the secretariat and entrusted to the forwarding unit for implementation. Especially, issuing of “MENTORING NEWS” and mail magazines, and activities to promote program understanding and public relations by holding lectures, get-togethers and experience report meetings, were assumed completely by the secretariat. The secretariat also created groupware in order to create occasions by which mentors and mentees, guiding faculty, etc. could share and exchange information when required and cooperate with each other. Management of these activities was also carried out by the secretariat.

Evaluation of Program

The program evaluation of the mentor system was conducted with “the evaluation of its operation,” “the evaluation of the relationship of each pair (mentor/mentee),” and “the evaluation of individual career development.” The first two evaluations are process evaluations, while the last one is an outcome evaluation.

An evaluation sheet prepared by the secretariat was used for the evaluation of the operation. The evaluation sheet is a check sheet that consists of “the group of items related to operational issues,” “the group of items related to program issues,” and “the group of items related to the direction of the program,” and contains 25 items.

The relationship of each pair was evaluated by utilizing in a comprehensive manner the results of the questionnaire survey conducted twice (pre- and post- survey) (Figure 2 and Figure 3) as well as the monitoring sheet that was submitted each time a mentoring activity was completed, and by monitoring factors including the change in the behavior of the mentee and the level of satisfaction of the participants. As a result, it was considered that from the program, the mentees felt that they were able to:

- (1) obtain knowledge and skills that they had no opportunity of gaining prior to the program,
- (2) expand and obtain perspectives (new viewpoints and approaches they were not aware of before)
- (3) relearn and renew their awareness (realization that the knowledge they thought they had enough understanding of was in fact obscure).
- (4) obtain social networking opportunities (opportunities to meet various people through mentors)
- (5) engage in anticipatory socialization toward the real world (adjustment support for when they become members of society)
- (6) empower themselves (enhanced motivation toward research through career-related support as well as psychosocial support)
- (7) recognize and discover research challenges.

For individual career development, the degree of achievement of career development support was measured using MPI (Multi-facet Performance Index) TM [1], an assessment tool for career development support. This is an objective measurement tool based on psychometrics, and a psychological measurement tool to measure the expressed competency and performance. During the period of mentoring activities, a pretest and a posttest were conducted to compare the hopes of individual students for future professions, as well as their attitude, qualities, and potential between the pretest and posttest results, and between the experimental group (students who are mentees) and the control group (ordinary students who are not mentees). The results showed that mentees scored higher than ordinary students in terms of teamwork, target achievement, business acumen, leadership, and other aspects related to performance (Figure 4). There was no significant difference between the first and second test.

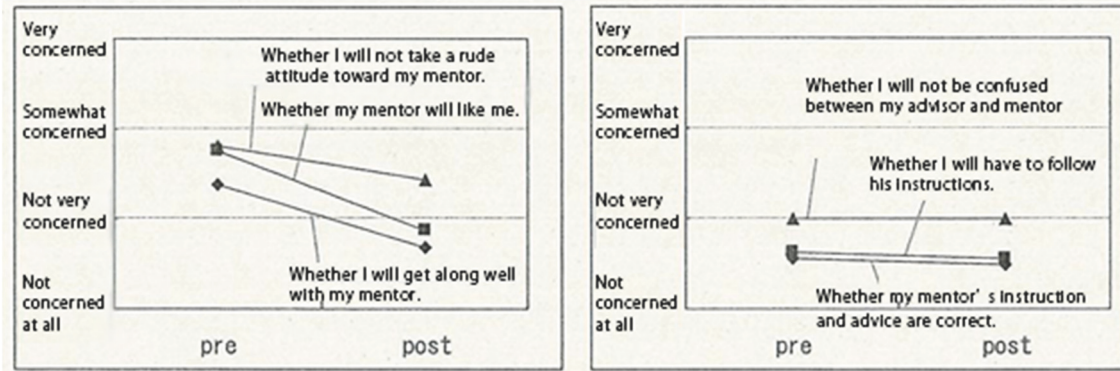


Figure 2. Comparison between pre- and post- questionnaire “Concerns about mentoring”

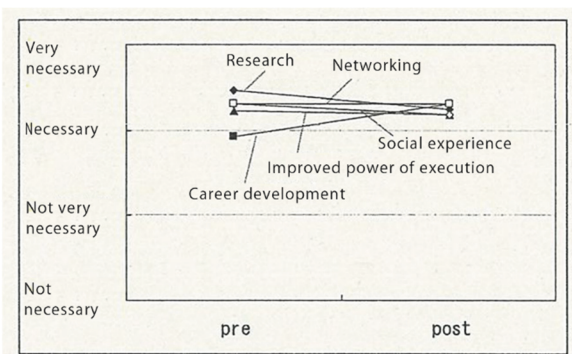


Figure 3. Comparison between pre- and post- questionnaire “How necessary is the mentor system for you?”

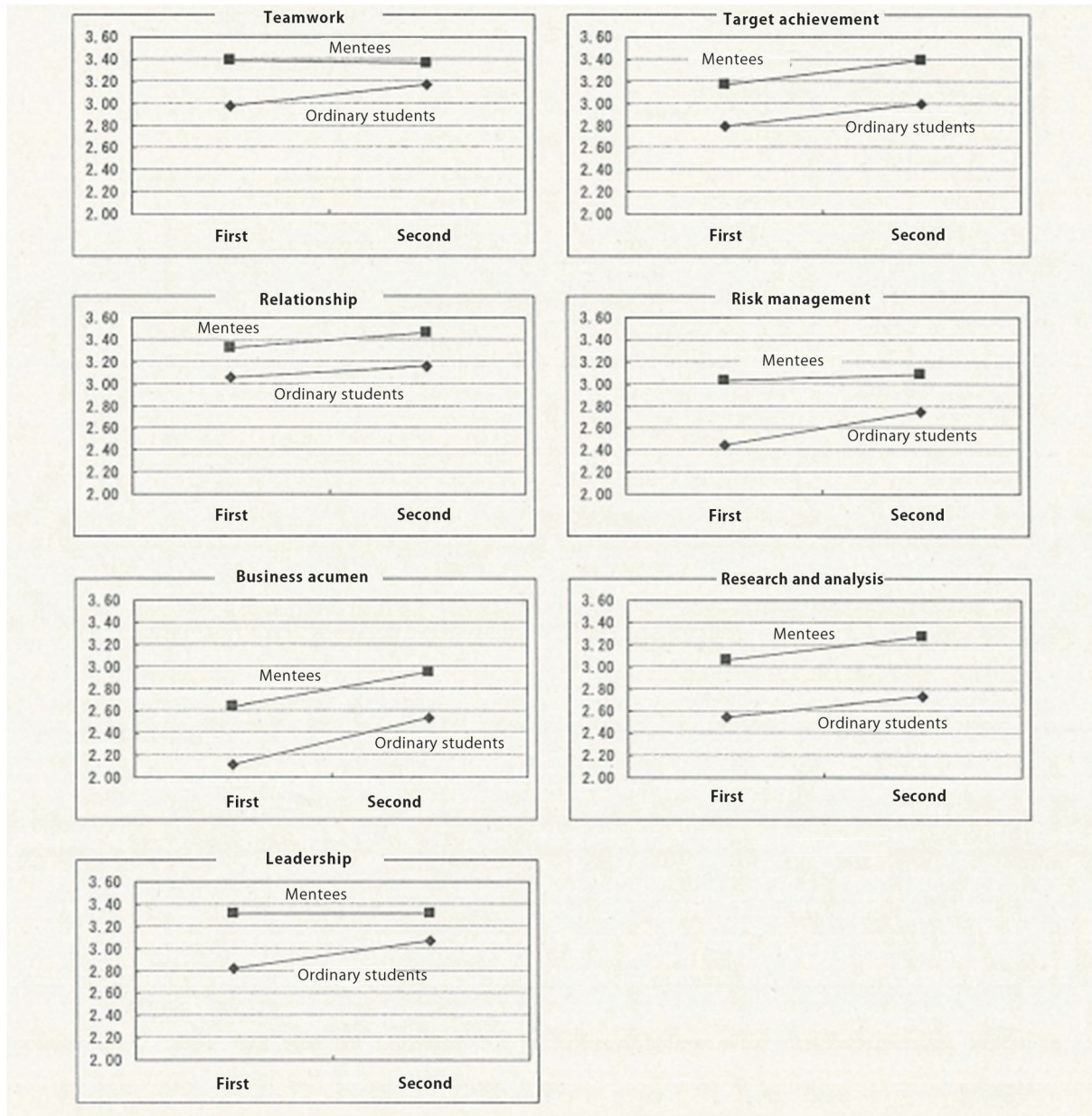


Figure 4. MPI in each performance aspect (ordinary students/mentees)

Future Issues for the Program

The mentoring researchers indicated the following as issues to deal with in the future in improving the program: (1) Strengthening public relations, (2) Securing the financial foundations, (3) Strengthening the function of the secretariat, (4) Investigating the possibilities of telephone mentoring and group mentoring which don't require direct face-to-face meetings.

Notes

This paper is prepared for facilitating discussions in case method situations.

[1] "MPI (Multi-facet Performance Index)™" is a psychological test for measuring job-related competencies in general developed and distributed by IAP (Institute of Applied Psychometrics)