

Teaching Statement

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My educational philosophy is “educating a person to have skills of development, proposal, evaluation, and communication and to be proactive in their research and projects”. Here, development skills mean ways to acquire technologies, plan solutions to problems, and execute the plan; proposal skills mean abilities to find and analyze issues, and create new social needs; evaluation skills mean ways to recognize the results of projects done by oneself or others. My experience of teaching and interacting with students in Japan (Kyoto Univ., Nara Inst. of Sci. and Tech.; NAIST), United States (CMU), and Germany (Bremen Univ.) enables me to estimate the abilities of students fairly accurately. Based on this estimate, I provide education adequate for each student. When I was an assistant professor at NAIST, I developed a program of robotics education for graduate students where advanced version of project-based learning (PBL) was introduced [1]. I believe the PBL is a very good style to educate above skills. Currently I keep doing this in the Humanoids class in CMU.

I will teach in topics like “unified systems including reasoning, learning, actions, and perception,” and “robot learning.” Since as I wrote in the research statement, I have much experience on robot learning, reinforcement learning for robots, high-level reasoning, and so on, it is adequate for me to teach these topics. I will emphasize that unifying many different strategies will increase the robustness of robotic systems, which include not only algorithmic strategies like model-free and model-based reinforcement learning, but also manufacturing sophisticated tools for robots. After graduation, the students will contribute a lot in related fields, including home-care and service robots, autonomous vehicles, and Internet of things.

Education in classrooms: Lectures and exercises are important in teaching technologies, but they are not enough to learn development and other skills. I will introduce PBL. A PBL introduced in NAIST was entitled “Expert-level RT-PBL” where students formed a group, created a proposal to acquire funds, submitted an application (faculties judged the proposals and assigned funds), and conducted the project. Finally they were evaluated by third party, for example in academic conferences. It was aimed at training communication, development, proposal, and evaluation skills respectively. Especially making a proposal was a good training for students; no other courses provided such an activity. Many of students found that actual progress was much different from plans in the proposals. This experience would help the students to work on their new projects. What I found by conducting this PBL for several years was the importance of training each skill step by step. For example since we noticed many students worked independently rather than forming groups, we implemented a small PBL where group work was assigned in order to train the group communication skill. Another example was brainstorming; writing a proposal was difficult for many students, so we conducted brainstorming and helped them to create ideas and write proposals. Through the experience of having the Humanoids class in CMU, I found that my strategy worked generally.

Education in laboratory: Research projects in laboratory are advanced versions of PBL. In addition to the strategies of PBL mentioned above, students will learn to progress projects under the professor’s supervision. In order to create a sustainable laboratory, encouraging students to make documentations is important. For example I developed an on-line text system when I worked in NAIST (<http://robotics.naist.jp/edu/text/?Robotics> Click English button), which helped newcomers a lot. Additionally, in order to train international communication skill, I will conduct international collaborations, encourage students to join international conferences,

send students to collaborative institutes, host students from collaborative institutes, and so on. I have collaboration with NAIST in Japan and University of Bremen in Germany and sometimes I host students.

References

- [1] Akihiko Yamaguchi, Jun Takamatsu, Atsutoshi Ikeda, Masahiro Yoshikawa, Takamitsu Matsumura, Masayuki Kanbara, and Tsukasa Ogasawara. Graduate curriculum of robot education centered on project based learning. *Journal of the Robotics Society of Japan*, 34(9):615–622, 2016. (in Japanese).