



Nurturing a Broader and More Innovative Mindset in Graduate Students and Postdocs

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Abstract

In Japan, while one recent science and technology policy demands that graduate schools educate their students to become highly skilled personnel who can play an active role not only in academia but also in industry, it has been argued that graduate school education is narrowly focused.

In 2014, Hiroshima University, Yamaguchi University and Tokushima University led the establishment of the regional industry-academia-government consortium, the "Home for Innovative Researchers and Academic Knowledge Users (HIRAKU)", in collaboration with other universities, private companies and public organizations in western Japan. The aim was to provide graduate students and postdoctoral researchers opportunities to apply their specialized knowledge and skills to real societal problems, not only to career/skills development.

Under the "HIRAKU" umbrella, our new programme is designed to provide students with an interactive platform by establishing connections between various courses, opportunities and the newly constructed IT system linked to non-academic sectors. We believe a stronger link between university and industry can influence the career outcomes of students.

In this contribution, the overall structure of our nested programme and its innovative approaches to nurture a broader and more innovative mindset in graduate students and postdoctoral researchers are presented and illustrated with some examples.

Keywords: *graduate programme, early career researcher, transferable skills, career*

1. Responding to the demands of recent science and technology policies

Certain OECD countries have expanded their graduate education programmes based on the assumption of growing future demand for engineers and scientists [1], and Japan also doubled the number of students entering graduate programmes in the 1990s. In recent years, Japan has generated about 16,000 doctoral graduates annually. However, the number of students entering doctoral programmes reached its peak in FY2003 and then started to decline. Consequently, the number of postdoctoral researchers (postdocs) increased to approximately 18,000 in FY2008 and then began to decline from that point onwards [2]. Various explanations have been proposed as the cause of these recent declines. One of the main reasons put forward was the uncertain future career paths for early career researchers, including non-academic careers.

Various factors surrounding the academic research environment have influenced early career researchers such as doctoral students and postdocs when pursuing their academic careers. Decreases in university operating subsidies, along with deferred retirement age and increases in fixed-term employment, have led to early career researchers remaining in postdoctoral positions for longer durations.

From industry employers' perspectives, some employability issues have been raised. Graduate education is narrowly focused on specific areas with little appreciation of the broader connections outside of their specialized fields; in addition, doctorate holders tend to lack certain transferrable skills such as communication skills and cooperativeness.

It has been crucial for Japan's graduate schools to strengthen the educational quality and attractiveness of doctoral programmes. To realize these goals, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) has been investing in various funding schemes.

One such funding scheme by MEXT, aimed at reforming Japan's graduate education, is the "Programme for Leading Graduate Schools", which started in FY2011 and is focused on fostering future leaders in business, higher education and government sectors by introducing a five-year integrated master's-doctoral programme.

Another type of funding scheme is aimed at improving the career prospects of doctoral students and postdocs. The first government-funded program centred around the career paths of early career researchers by providing appropriate training started in FY2006. Since then, various government-funded programmes have followed. In FY2014, the MEXT programme "Building of Consortia for the

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Development of Human Resources in Science and Technology (Programme for Developing Next Generation Researchers)” was launched and the industry-government-academia consortium led by Hiroshima University – namely, the “Home for Innovative Researchers and Academic Knowledge Users (HIRAKU)” – was selected and funded for at least five years [3].

In the following sections, our HIRAKU programme concept, structure and approaches are explained and illustrated with some practical examples.

2. Concept and structure of the HIRAKU programme

As mentioned earlier, the HIRAKU programme is a joint venture between Hiroshima University, Yamaguchi University and Tokushima University in collaboration with other universities, companies and public institutions mainly located in the Chugoku-Shikoku regions. The HIRAKU consortium consists of 58 organizations as of November 2017, and aims to nurture science and technology experts who are more than merely specialists in their specific fields, but who are also capable of solving highly complex problems and employing an innovative approach. Under the HIRAKU umbrella, two major pillars have been devised and implemented, with one being aimed at doctoral students and postdocs, and the other at tenure-track researchers. In this contribution, the main concept and structure of the first pillar programme for doctoral students and postdocs are described.

2.1 Concept

We provide a platform or dialogue for early career researchers to interact effectively with target “influencers” such as those researchers from different fields, private companies and the general public.

The HIRAKU programme employs multiple approaches and channels to help early career researchers:

- discover the wider implication of his/her research and how it links to other fields of study
- realize the applicability of his/her research knowledge and skills to other areas
- acquire broader perspectives for innovation
- gain transferable skills for their future career
- develop valuable networks to enhance sustainable personal growth.

2.2 Structure

What competencies are required or needed for early career researchers to pursue a research career or non-academic career? Although there have been some attempts to clarify the skill sets required by early career researchers, almost no standard is widely recognized, except the Vitae Researcher Development Framework (RDF) [4].

Under the HIRAKU programme, we design and provide various “events” (classes, seminars, workshops, competitions, internships, etc.) for early career researchers, and the events are linked to the assessment of the Vitae RDF. Furthermore, these events can be categorized into five levels in terms of the depth of awareness and interaction with target influencers, as follows:

Level 1: understand and improve transferable skills

Level 2: realize how research experience is connected to non-academia

Level 3: inspire and influence others with research vision and content

Level 4: apply research knowledge and skills to societal and business problems

Level 5: solve non-academic problems using research knowledge and skills

To be discussed below, all levels of the HIRAKU programme are carefully nested so that every event contains elements linked to each other.

3. Programme implementation and practices

As examples, this section describes some of the main HIRAKU events related to Levels 3–5, and their aims and approaches are explained.

3.1 The core IT system (HIRAKU-PF)

To support our programme effectively, the “Young Researchers Portfolio (HIRAKU-PF)” was constructed and launched on 25 March 2016, as a core IT system. It aims to provide early career researchers with a tool to recognize their strengths and areas for improvement, based on the Vitae



RDF. It also provides them with opportunities to showcase their research activities and achievements, and interact with other researchers or private sectors. The system delivers a host of information on career development and skill enhancement.

The HIRAKU-PF system was designed so that users from different sectors can “gather”, “mingle” and “be connected”.

3.2 The Three-Minute Thesis (3MT) Competition (Level 3)

The 3MT Competition was first developed by The University of Queensland in Australia for doctoral students to nurture their academic, presentation and research communication skills [6]. Students present their research in three minutes, using only one slide, in a language appropriate to a non-specialist audience.

Though we have been running the 3MT Competition for the HIRAKU programme since 2015, our HIRAKU 3MT framework is somewhat different to the frameworks used overseas. We invite both the general public, including high school students and private companies, to the event. This annual event is sponsored by private companies and public organizations. Special sponsor companies send judges to the competition and provide prizes and career/skill development opportunities such as internships and laboratory tours.

The aim of our 3MT Competition is to strengthen students' ability to communicate effectively, promote the attractiveness of doctoral research and provide information to help the younger generation (e.g. high school students) make informed career choices, and broaden the perception of industry and the general public in terms of doctoral students' abilities and the importance of their research.

The 2017 competition was held in Higashi-Hiroshima on 25 November 2017, and 36 competitors from ten universities presented their research to an audience of around 260 people.

Pre-training and dinner sessions prior to the competition and a lunchtime gathering on the day of the competition were scheduled to enable students to network with other students from different fields and schools. In addition, a dinner time gathering on the day of the competition helped students exchange their ideas and views with sponsor companies and other competitors to facilitate further networking opportunities.

Furthermore, each competitor's presentation video can be uploaded to his/her own profile page on the HIRAKU-PF system for PR. All HIRAKU-PF users, including member companies and public organizations, can view the presenters' videos and contact them if desired.

3.3 Proposal-based workshop (Level 4)

In standard graduate education settings, graduate students rarely have a chance to have in-depth discussions with business people. In our proposal-based workshop, non-academic sectors such as private companies are invited to present their problems and/or needs to graduate students and postdocs. Several graduate students and postdocs from various fields form groups to tackle the problem and present their potential solutions.

Problems proposed by companies and public organizations are categorized in two levels, as follows:

Category 1: discover a new concept for goods and services

Category 2: create added value for goods and services from a scientific perspective.

In FY2017, three themes were proposed by two private companies. The workshop comprised a series of five half-day sessions, as follows:

Day 1: proposers'/participants' presentation and discussion

Day 2: on-site tour and discussion

Day 3: lecture and discussion

Day 4: lecture and discussion

Day 5: presentation and evaluation of the final solution.

We divided the participants into three groups, assigning one theme to each. Each group consisted of graduate students and postdocs from different fields in addition to staff from “proposer companies” and public organizations.

Participants were thus able to appreciate the importance of diversity when creating new values and ideas.



For out of classroom discussions, the HIRAKU-PF system provided a secure bulletin board space for each group members.

3.4 Long-term internship (Level 5)

The aim of our HIRAKU long-term internship programme is to encourage early career researchers to explore new domains beyond their specialization, with a determination and enthusiasm to change society. We expect them to contribute to solving real societal or business problems, strengthen their transferable skills, and expand their future career options.

Before sending interns for on-the-job training, with the help of the HIRAKU-PF system equipped with the Vitae RDF assessment tool, we identify gaps in their experiences or competencies. The internship training tasks are carefully arranged so as to fill these gaps and improve interns' competencies.

All progress is reported by interns and timely, appropriate advice is provided by career coordinators and counsellors, via the HIRAKU-PF system.

4. Summary and next steps

Our experience so far indicates how effectively we can involve early career researchers and influencers and establish stronger bonds among them, which is key to maximizing educational effectiveness and sustainable personal growth. In the next stage, we will refine the HIRAKU-PF system in order to capture users' online activities linked to their attendance and achievement records, skill assessment results and career progress. It will also allow us to analyze how new connections among users evolve. By linking the level of student satisfaction with these fundamental data, we plan to evaluate the effectiveness of our HIRAKU programme with quantitative evidence.

References

- [1] Organisation for Economic Co-operation and Development (OECD), "Science and Technology Policy: Review and Outlook", Paris, OECD, 1991.
- [2] Shinoda, H, et al., "Survey on Postdoctoral Fellows Regarding Employment and Careers (FY2012 Data)", RM-232, Tokyo, NISTEP, 2014.
- [3] <http://home.hiroshima-u.ac.jp/hiraku/en/>
- [4] <https://www.vitae.ac.uk/researchers-professional-development/>