

The Exploration of the Development of Taiwan's PhD Education in the Field of Biomedical Sciences

Tzu-heng Chiu (tzchiu@tmu.edu.tw)

Professor, Center for General Education / Library Director,
Taipei Medical University, Taiwan

Hung-te Wang (hunter@ncl.edu.tw)

Librarian, Knowledge Services Division, National Central Library, Taiwan

An-chi Lin (angela@ncl.edu.tw)

Editor, Knowledge Services Division, National Central Library, Taiwan

I. Research Background and Motive

Between the 2010–2014 academic years, approximately 4,000 PhD students have graduated from universities in Taiwan each year; among them, approximately 700 students graduated in the field of biomedical sciences (including fields such as medicine, health, and life science). In the 2015 academic year, although the total number of PhD graduates nationwide was the lowest (3,617 graduates) in 6 years, the number of graduates in fields related to biomedical sciences increased.

Generally, PhD graduates aspire to be employed as faculty members in related departments in universities and colleges or as postdoctoral researchers in their graduating schools, whereas fewer will choose to work in related industries. This study analyzed the official web pages of university departments in Taiwan related to the biomedical sciences to compile data on the graduating universities and departments of their full-time faculty members. This enabled an inference on the employment status of biomedical science PhD graduates who are working as teachers.

The authors collected and compiled open data from the National Digital Library of Theses and Dissertations in Taiwan (NDLTD system) of National Central Library, Taiwan, faculty information displayed on the web pages of every biomedical science-related department in Taiwanese universities, the list of universities and colleges in Taiwan provided by the Ministry of Education, and the websites of all universities and colleges in Taiwan. Accordingly, the educational development of PhD graduates in the biomedical sciences was examined. In this presentation, the following research topics are discussed:

1. The distributions of graduation year, school category, and school location listed in

biomedical science dissertations in Taiwan.

2. The exact employment statuses of PhD graduates of the biomedical sciences in Taiwan employed as faculty members in universities and colleges. This topic was analyzed by

(1). Examining the career paths of these graduates according to their graduating schools and their schools of employment.

(2). Examining the phenomenon of joint appointments in Taiwan by determining the appointment status of these graduates in their schools of employment.

II. Methodology

The most labor-intensive processes of this research were data cleansing and defining, collecting, and organizing the data sets. The data sets employed in this study were as follows:

Data Set 1: bibliographic records of biomedical science–related dissertations.

Data Set 2: a list of faculty members in the biomedical science–related departments of universities and colleges in Taiwan with a domestic PhD degree.

Data Set 3: a list of the categories and locations of universities and colleges in Taiwan.

The biomedical science–related dissertations in Data Set 1 were selected in accordance with the department code subjected to authority control by the NDLTD system. Subsequently, from the 936 Taiwanese graduate schools, 26,023 dissertations from 1972 to 2017 were retrieved from the system on October 1, 2017. For Data Set 2, no ready-to-use data were available. Therefore, on the basis of the study objectives and decisions made during the research team meeting, the research assistants manually collected data from the faculty information web pages of every biomedical science–related department in Taiwanese universities. The data included the names (both Chinese and English), graduating school and department, school and department of employment, graduation year (if stated), appointment status (i.e., full-time professor, adjunct professor, joint appointment professor, or professor emeritus) of faculty members with a domestic PhD degree. Finally, the research assistants compiled all data into a Microsoft Excel spreadsheet. Data Set 3 was organized by the research assistants based on the existing data files downloaded from the Ministry of Education website.

Because the NDLTD system has a distributed implementation architecture, (i.e., graduate students from each school submit their works for examination by the person in charge of each school), the quality and completeness of each record may be inconsistent. Consequently, a considerable amount of labor time was invested in organizing the bibliographic records obtained from this system. However, the entry errors could not be processed, which is a limitation of this study.

III. Research Findings

(1) Graduation year, school category, and school location of the PhD graduates (obtained from dissertations) from the biomedical sciences in Taiwan

1. Graduation year

Among the 26,023 dissertations reviewed in this study, 35 were written in the 1970s, 468 in the 1980s, 3,783 in the 1990s, 9,544 in the 2000s, and 12,193 between 2010 and 2017. The number of dissertations in the biomedical sciences field has increased substantially. In particular, the number of biomedical sciences dissertations in the 2000s is 2.5 times that of those in the 1990s.

2. School Category

According to the data analysis, PhD education in the biomedical sciences in Taiwan is mainly centered in public universities, where 85% of dissertations were produced; in addition, 96% of PhD graduates were educated in the higher education system rather than the technical or vocational education system.

3. Graduating School Location

Based on a review of the locations of the 65 schools responsible for the 26,023 dissertations analyzed, this study revealed that the geographical distribution of such schools is highly disproportionate. Seventy percent of the PhD students were enrolled in schools in Northern Taiwan. In terms of counties and cities, Taipei City contains 16 universities that offer PhD programs in the field of biomedical sciences; Taichung City has 11 such universities, ranking second in Taiwan. In terms of the average number of dissertations produced by each school, the only two universities in Hsinchu City offering PhD programs in the biomedical sciences currently produces approximately 2,500 dissertations each year, ranking first in research capacity. The three universities in Tainan City offering such programs were reasonably productive, ranking second overall, with an average of 828 dissertations published each year.

(2) Employment status of biomedical science PhD graduates in Taiwan employed as faculty members in universities and colleges.

1. Examination of the career paths of these graduates according to their graduating schools and schools of employment.

(1) Employed in their graduating school.

A total of 7,868 teachers employed in biomedical science-related departments in Taiwan have a PhD degree from one of the 62 universities or colleges in Taiwan. According to the research findings, PhD students of National Kaohsiung University of Applied Sciences, Chung Shan Medical University, National Taipei University, Fu Jen

Catholic University, Taipei Medical University, China Medical University, and National Chiayi University were more likely to stay or return to their school of graduation for employment in teaching (more than 50%) compared with those from other higher education institutions in Taiwan.

By contrast, none of the biomedical science PhD graduates of the following universities were employed in their graduating school: Dayeh University, Chang Jung Christian University, National Defense University, Chaoyang University of Technology, Soochow University, Central Police University, Asia University, Nanhua University, National Pingtung University, University of Taipei, National Taipei University of Nursing and Health Sciences, Nan Kai University of Technology, National Taipei University of Education, and National Taiwan University of Sport.

(2) Employment in other universities in Taiwan

In terms of PhD graduates seeking employment in universities other than their graduating school, at the time of writing, biomedical science PhD graduates of National Taiwan University and National Tsing Hua University are employed in more than 100 universities and colleges in the country, ranking joint first among domestic universities, followed by National Chiao Tung University, National Cheng Kung University, and National Central University.

2. Appointment status and the joint appointment phenomenon

(1) Appointment status

Of all 7,868 faculty members in biomedical science-related departments in Taiwan with a domestic degree, 6,433 of them (81.86%) were full-time faculty members. Moreover, this study revealed that more than 500 faculty members were marked as joint-appointment faculty members on department web pages and it was determined that this phenomenon required further investigation.

(2) Joint appointment phenomenon

A. Full-time appointment in two or more academic units of the same university

In terms of joint appointment, in addition to the aforementioned faculty members marked on websites as joint-appointment faculty members, this study found that some teachers were marked as full-time faculty members in multiple departments of the same university, which can be considered to be another form of joint appointment. According to this study, one faculty member being listed as a full-time staff member in two or more departments in the same university is not uncommon; moreover, nine faculty members are listed on university websites as full-time faculty members in three or more departments of the same university. The aforementioned phenomenon is most

commonly observed (a) in the departments and related graduate institutes of the same field the PhD graduates studied, (b) in different departments of the same university, and (c) for faculty members in departments related to the same profession but in different campuses of the same university.

B. Intraschool full-time, adjunct, and joint appointments

Of all the biomedical science–related departments in Taiwan, in terms of public universities, this phenomenon of one faculty member being listed as a full-time, adjunct staff member with joint appointments with multiple departments of the same university was most commonly observed in National Taiwan University, National Yang-Ming University, and National Cheng Kung University. In particular, two faculty members of National Taiwan University were listed as full-time, adjunct staff members with joint appointments with five academic units of the university. Among private universities, three faculty members in the School of Medicine, Graduate Institute of Immunology, and Graduate Institute of Basic Medical Science in China Medical University were full-time joint appointment faculty members, as were two teachers in the Graduate Institute of Medicine, PhD Program in Translational Medicine, and M. Sc. Program in Tropical Medicine in Kaohsiung Medical University.

C. Inter-school joint appointment phenomenon

Interschool joint appointments are beneficial not only for strengthening the faculty teams of both universities but also for increasing the research paper publication count of each school because the same paper can be counted by both schools. In other words, this appears to be an ideal cooperation method for universities. According to this research, National Taiwan University and National Yang-Ming University have been working closely in terms of education in the biomedical sciences. In addition, several prominent scholars have become faculty members of multiple universities because of the PhD Program in Translational Medicine founded by Academia Sinica and numerous well-known medical schools such as National Taiwan University and National Yang-Ming University. Moreover, interschool joint appointments may have arisen from individual expertise in a particular area or other situations. Among private universities, Kaohsiung Medical University works closely with National Sun Yat-sen University, which may be the result of their geographical proximity. For example, numerous full-time faculty members of Kaohsiung Medical University are also faculty members in biomedical science–related departments in National Sun Yat-sen University; and full-time faculty members of National Sun Yat-sen University with life science–related expertise are also faculty members in related departments in Kaohsiung Medical University. A similar joint appointment phenomenon has been observed in biomedical

science-related departments of China Medical University and Asia University of Central Taiwan. This study also documented a few number of faculty members having joint appointments in three universities in departments of related fields.

IV. Conclusion

By employing the NDLTD system and other open data online, this study revealed a considerable increase in PhD graduates in the biomedical sciences in Taiwan since the 21st century. Most graduated from public universities in the higher education system; moreover, 70% of the PhD students were educated in Northern Taiwan.

In terms of being employed as faculty members in academic units, over 50% of biomedical science PhD graduates of seven of the universities remained with or returned to their graduating school. The PhD graduates of National Taiwan University and National Tsing Hua University are most popular with universities in Taiwan; such graduates are employed as teachers in more than 100 universities and colleges in Taiwan.

Regarding appointment status, more than 500 biomedical science faculty members in Taiwan hold joint appointments. This joint appointment may be: (1) a full-time appointment in two or more academic units of the same university; (2) an intraschool, full-time, adjunct, and joint appointment; and (3) an interschool joint appointment. Particularly, the details of the phenomena of situations (1) and (3) and their causes merit further consideration and examination.