

## Ph. D. PROGRAM IN STATISTICS

### A Report and Some Suggestions

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This report, prepared at the suggestion of Dr. T. Mijares, Deputy Director General, NEDA, outlines some of the possible ways of running a Ph. D. program in Statistics at the universities in Manila and Los Baños. To collect the necessary background information and to assess the facilities available to run a Ph.D. program, I have visited the University of the Philippines (UP), De La Salle University (DLSU) and Ateneo de Manila University (AU) in Metro Manila, and the University of the Philippines at Los Baños (UPLB) and had discussions with staff members involved in teaching statistics. I had several discussions with Dr. T. Mijares and his colleagues at NEDA and also had the opportunity to meet the members of the Board of the Philippine Statistical Association (PSA). I also met the Board members of the National Research Council of the Philippines (NRCP). Some of the ideas given in this report emerged in a joint meeting with Dr. T. Mijares and his colleagues at NEDA, professors from the UP, DLSU, AU and UPLB, and Dr. I David, Dr. M. Orense and Dr. C. Parel.

The UP and UPLB have been offering courses in statistics leading to the Master's degree for over 25 years, but the lack of library facilities and the critical number of qualified teachers to share the burden of teaching and guiding research students have prevented them from starting a Ph.D. program. Both the universities have gradually acquired some competent staff members and built up library and computing facilities to an adequate level to give advanced courses in statistics. The Statistical Center at the UP has already an approved program for advanced courses and research leading to the Ph. D. de-

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gree, and some students are already doing research for a Ph. D. degree. The UPLB has prepared a draft proposal for introducing a Ph.D. program, which I hope will be approved by the appropriate authorities.

I believe that the facilities currently available at the UP, UPLB, DLSU and AU, if properly mobilized, are adequate to start a Ph.D. program at least in some areas of statistics without further delay. A Ph.D. program is essential for the growth of the statistics department in any university. It provides the proper atmosphere for the staff members to improve their fields of interest. With more knowledgeable teachers, the quality of teaching will improve, and as a consequence the quality of students produced will be high. Further, a statistics department with a good Ph.D. program will attract good students and also qualified statisticians to accept jobs and work in the department. A recent study by P. Reyes sponsored by NEDA, entitled "Profile of Statistical Manpower in Government", showed that there is a serious shortage of qualified statisticians particularly at the Ph.D. level. The study also envisages an increase in the demand for well-trained statisticians in the coming years to work in government, industry and in the academic institutions. There is, therefore, an urgent need to establish Ph.D. programs in statistics. However, there are a number of issues to be considered to give a good start to the program, to sustain it and to expand it quickly to a full-fledged program covering all areas of statistical theory and applications.

To provide a good start to the Ph.D. program, it may be necessary to pool the expertise and the facilities available not only at the UP and UPLB, but also at DLSU, AU and NEDA and run the program as a collaborative effort to the extent feasible, at least until such time as each university develops its own capability to run an independent program. It is envisaged that each university will have its own students in the Ph.D. program who will receive its Ph.D. degree on the completion of specified requirements. They need only to collaborate in making the facilities available at any university to students from other universities.

To evolve a workable plan for this purpose, I suggest the formation of a task force consisting of representatives from the UP, UPLB, DLSU, AU and NEDA to consider the following issues:

(i) Laying down the minimum qualifications for admission of students to the Ph.D. program. The prerequisite should be determined depending on the undergraduate and graduate programs available in the individual universities. (It is the practice in many universities to admit students to the Ph.D. program after they receive the Master's Degree in Statistics. Students from other disciplines such as mathematics may be admitted to the Ph.D. program in Statistics provisionally and the admission finalized on their acquiring the Master's Degree in Statistics).

(ii) To determine the core (compulsory) courses to be taken by all Ph.D. students. (Besides some advanced courses in statistics, it would be useful to include advanced courses in real analysis, vector spaces and matrix algebra and computational statistics (use of computers) among the compulsory subjects).

(iii) To make a list of elective subjects and to set up appropriate committees for drafting the course outlines for each subject and suggesting textbooks and other reading materials. (The course outline need not be rigid in the case of elective subjects. It should be sufficiently flexible to give the teacher freedom to cover additional topics of his or her interest. I have seen the proposals made by the Statistical Center at the UP and the Statistics Department at the UPLB for instituting the Ph.D. program at their universities. These proposals contain comprehensive lists of courses. I have also made available lists of courses given in the graduate program in some of the American universities. The committee may like to examine all these papers and make a suitable list of compulsory and elective courses. The elective courses offered in any year will depend on the availability of qualified staff members to teach those courses. It will also depend on the demand for statisticians specializing in certain areas of applications of statistics).

(iv) To outline the procedures for allowing the Ph.D. students of one university to take courses offered at other universities.

(v) To determine the timing and sequence in which the courses are given. (For students in the universities in Manila, there may not be difficulty in taking courses given in different universities in any particular semester or academic term. In view of transportation difficulties, it may not be feasible for students to take some courses at

Manila universities and some at the UPLB in any given term. But it should be possible for students to spend a whole term and take all the courses given either at the universities in Manila or at the UPLB. For this, the timing and sequences of the courses given at each university should be determined to suit the convenience of all the students. As far as possible, courses given at one university need not be duplicated at another university).

(vi) To evolve common procedures to the extent possible in the assessment of the students' performance in the examinations and evaluating the thesis.

(vii) To make an overall plan for the courses to be offered by different universities in any given year and to identify the qualified staff members for giving the various courses.

(viii) To discuss any other academic or administrative problems relevant to the implementation of a Ph.D. degree on a collaborative basis.

A collaborative effort needs a suitable administrative set up to discuss common problems. I understand that there is already a consortium for running the Ph.D. programs in Mathematics, Physics, and Chemistry with the participation of the UP, DLSU, and AU. It appears that a similar arrangement with all the rules and regulations of the consortium would be ideal for the statistics program. It is important that statistics is considered as a separate discipline under the consortium. There is also the question of bringing in the UPLB as an additional participant in the statistics program.

In the initial stages of the Ph.D. program, efforts may be concentrated on faculty improvement. Members of the faculty who do not have a Ph.D. degree should be encouraged to take the Ph.D. courses and to prepare themselves for writing a dissertation for the Ph.D. degree. For this purpose, the faculty may be given some release time from the regular teaching load. Other possibilities such as study leave may also be considered.

At present, even with the pooled resources of all the universities, there will be shortage of qualified staff in some areas of statistics. Attempts can be made to meet the deficiency by inviting professors from abroad to teach at one of the universities, and also by sending faculty members abroad for specializing in certain areas. Of course,

greater benefit will accrue by bringing specialists from abroad and asking them to give courses to advanced students and faculty members. The funding of the visiting professors will be a difficult problem, but the following possibilities may be explored:

(i) The National Science and Technology Authority (NSTA) has agreements with the Royal Society in the U.K. and the Indian National Science Academy (INSA) in India for exchange of scientists. Presumably, it has agreements with other foreign academies. Under this program, the universities can identify the scientists they wish to have from abroad and request the NSTA to sponsor their visit under the exchange program. (Generally, such visitors would be available for a short period of time. Arrangement may be made by previous correspondence so that they give short intensive courses in specific areas of statistics for the benefit of staff members and advanced students. They could also be available for consultation by research students).

(ii) Provision may be made in the budget of one university or on a pooled basis to invite one or more professors from abroad to spend one or two whole semesters to give advanced courses in the Ph.D. program. Professors who are on sabbatical leave will be willing to accept such assignments for one or two terms on modest remuneration. It should be possible to have a continuous stream of visiting professors on such a basis. (I talked to some professors in the U.S.A. who will be on a sabbatical leave in the academic year 84-85 about their availability for visiting Manila and teaching at one of the universities in the Ph.D. program. Several have expressed their willingness to do so. The actual terms under which they would be willing to come can be negotiated in each individual case).

(iii) The International Rice and Research Institute (IRRI) invites experts from time to time to advise them in their research projects and to teach in their training programs. The universities may request them during their stay at IRRI to give short intensive courses or conduct weekly seminars for the benefit of research students. The expenses involved in such cases will be minimal. (I understand Dr. D. Finney from the U.K. will be visiting the IRRI for a whole year beginning from January 1984. He may be invited to give lectures and also to help in the development of the Ph.D. program).

(iv) Some international organizations like the ADB and WHO are located in Manila and they usually have experts in statistics regularly working with them or visiting them for short periods of time. Some of them may like to give regular courses at the universities. They may also be willing to guide research students in their special areas of interest. (I understand that Dr. I. David now working at the ADB will be giving a course on Sample Surveys at the Statistical Center of the UP. Efforts may be made to locate such experts to give similar courses.)

(v) There are also possibilities of obtaining grants from organizations like the UNDP to invite visitors for short or long periods on a continuing basis, which should be explored.

(vi) I understand that under the consortium for Mathematics, Physics and Chemistry, provisions already exist for inviting professors from the universities in Australia, Singapore, and Japan and the U.K. (under the British Council Program), and for scholars from the Philippines to spend short periods of time in these countries. This program could be extended to cover statistics.

(vii) When a visitor gives a course of lectures it would be useful to designate one or two staff members and advanced students to attend the course and prepare notes of the lectures, with some details added from original sources in consultation with the visitor. Such notes would be useful for future reference by the students and the staff.

(viii) The Indian Statistical Institute usually offers scholarships to students from abroad for study and research. Some of the staff members and advanced students, who are prepared to spend three to four years abroad, may be encouraged to apply for admission and financial assistance for study and research leading to a Ph.D. degree at the Indian Statistical Institute. Several universities in the U.S.A. admit good students to graduate programs leading to a Ph.D. degree and also offer assistantships (of the order of 600 dollars per month). Interested students and staff members may write to the universities in the U.S.A. for further information and application forms.

As I mentioned in the beginning of this report, facilities already exist at the UP and UPLB for giving the core courses and starting the Ph.D. program in certain areas of statistics. For instance, at the

UPLB and IRRI there are specialists in design of experiments, biometrics and genetics who can give advanced courses in these areas and also guide research students. At the UP, with the assistance of the specialists in NEDA and other organizations, special courses can be offered in econometrics, economic statistics and sample surveys. Candidates receiving Ph.D. degrees with a research thesis in econometrics or economic statistics or sample surveys will be in great demand for work in the government and international agencies in Manila. It would be appropriate to give some emphasis to these areas in the initial stages of the Ph.D. program. Other subjects of specialization could be introduced when qualified staff members are available.

Every student in the Ph.D. program should be familiar with the use of computers. The ability to use the existing computer package programs to write their own programs when necessary greatly enhances the scope of research work in statistics. The existing computer facilities may have to be strengthened as the Ph.D. program develops. (Most of the theses in statistics written by the students in the U.S.A. report simulation results to supplement the theoretical investigations).

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Dr. M. Swaminathan, Director General of IRRI, expressed great interest in the proposed Ph.D. program and offered to give his advice and help in this connection. I would like to thank him for inviting me to IRRI and giving me an opportunity to see the work of the Institute.

My visit to Manila was initiated by Dr. T. Mijares and NSTA and supported by UNDP. I would like to express my thanks to them.

During my visit to Manila, I had the honor of receiving the prestigious award of D. Sc. (honoris causa) degree from the UP, for which I would like to express my gratitude to President Angara and the authorities of the UP.