

## **Development Initiatives and Trend-Setting in Higher Biology Education**

**Gilda Carballo Rivero**

University of the Philippines Mindanao  
Institute of Biology, College of Science  
University of the Philippines Diliman

### **Introduction**

The importance of the Biological Sciences has come to fore, e.g.: vaccines for AIDS, bird flu and others, early detection and prevention of cancer, increased yield in crop production, management of diseases, population control, bioremediation, biodiversity, environmental management, global warming, among others. This enumeration is endless since the information from the ever-diversified fields of the Biological Sciences impacts on our lives and in many ways, provide for solutions to many present-day problems. As such, Biology is the SCIENCE OF THE MILLENIUM!

Biology like other sciences has struggled in this part of the world, to rise as a potential factor to uplift the lives of the Filipinos. Why so? For starters, our deeply rooted religious culture appears to show at the onset, an apparent discordance between science and religion. Another reason is the perceived notion that science is purely for the intellectuals and the academics, somehow, they not being aware that in whatever tasks they pursue, they are applying science.

This paper shall present a general view of the status as well as the trends in the development initiatives in Higher Biology Education. It shall also provide information on the efforts of the Commission on Higher Education (CHED) for the last decade, relative to the improvement of the Biology discipline at the tertiary level.

### **Status and Trends**

Based on the CHED Management Information System database, 150 of 1761 higher education institutions (HEIs) (8.5%) offer various Biology Programs. Of this number, 92 HEIs (61%) are private institutions, while

58 (39%) are SUCs. A total of around 252 Biology Programs are offered at different levels, i.e.: BS degrees offered in 144 HEIs, MS, in 26 HEIs, PhD, in 5 HEIs. Interestingly, not all HEIs offer a Bachelor of Science undergraduate program, but instead, a Bachelor of Arts and not all are titled as BS Biology (Table 1).

The data on the distribution of these HEIs by region and program level show that most institutions with the Biology degree offerings across levels are concentrated in the NCR. The Masters Program offerings are distributed in the NCR, Regions 7, 8, 10, and the Cordillera Autonomous Region, while, the Doctor of Philosophy Program offerings are in the NCR, Regions 8 and 10. It should be noted however, that this distribution data contain some discrepancies, e.g., those from the UP System, which are a consolidation of data from all its Constituent Universities (CUs). The seven CUs are located throughout the country.

Table 1. Biology Programs offered at different levels in Philippine higher education institutions.

Undergraduate Programs (16)	Masters Program (12)	Doctorate Programs (17)
AB Biology	MS in Biology	PhD in Biology
AB Major in Biology	MS Zoology	PhD in Botany
BS Biology	MS Botany	PhD in Entomology
Bachelor of Arts in Biology	MS Genetics	PhD in Genetics
Bachelor of Science in Biochemistry	Master of Science in Botany/Biology	PhD Microbiology
Bachelor of Science in	MS Entomology	Doctor of Philosophy
Bachelor of Science in Microbiology	Master of Science	Biology
Bachelor of Science in Zoology	Major in Entomology	PhD Molecular Biology and Biotechnology
Bachelor of Science Biology (Preparatory Medicine)	MS in Entomology	
BS Biology (General)	MS Molecular Biology	
BS Molecular Biology and Biotechnology	MS Molecular Biology and Biotechnology	
BS in Applied Biology	MS Plant Genetic Resources	
BS in Aquatic Biology		
BS Major in Biology		
BS Human Biology		

Note: Similar names were grouped together

The available statistics on student enrolment reveal that Biology offerings receive greater popularity over other disciplinary offerings in the sciences. And, we know why. The 2004–2005 enrolment data alone gave the following figures: 16,860 for biology, 3,876 for chemistry, 1,287 for physics, 1,277 for marine science, and 226 for geology. The graduation rates per level, based on data collected from 1990 to 2005, point to a weak performance rating with a range of 14–42% for the BS degree, 2–22% for the MS degree, and 0–18% for the PhD degree. Thus, only 1 out of 5 freshmen in the BS Biology program earns the degree they originally enrolled in while, 1 out of 10 completes MS/PhD degrees. The attrition rate for the BS program is mainly attributed to withdrawal from the roll due to academic or financial difficulties and secondly, to shift or transfer to more preferred programs. The attrition rate for the MS and PhD programs is basically due to financial difficulties.

The faculty profile indicates a total of about 1,175 faculty members with the following statistics on their graduate degrees: 772 hold MS degrees or are enrolled in an MS program; of this number, 252 are reported to have their MS degrees in Biology and allied fields. A total of 114 hold PhD degrees or are enrolled in the PhD program; 42 of these have their PhD degrees in Biology or in closely related fields.

### **Development Initiatives**

Since 1994, CHED has initiated the development of higher education through innovative programs and projects aimed at improving the Biology Program offerings, among others. The Centers of Excellence (COEs) project was among the recommendations of the Congressional Commission on Education (EDCOM) in 1991. It was a means of providing support to HEIs with a track record for exemplary performance with the aim of enabling these institutions to participate more actively in national development. The COEs were intended to be: (1) the means for the country to catch up with its ASEAN neighbors; (2) the resource hubs from which other schools may draw strength; and, (3) the core of Philippine graduate education and research. When CHED came to being in 1994, this project concept was applied. At that time, the project concept was still an intervening measure to support a select number of HEIs in specific fields, particularly needed in nation building. This concept was eventually tailored to fit the needs specific to the different fields. In science and mathematics, the support of the COEs was envisioned to be a follow up to the Engineering and Science Project (ESEP) of the Department of Science and Technology. The CHED Technical Panel for Science and Mathematics (TPSM) believed that more gains could be achieved through continued support to initial efforts, such as those derived from the ESEP-DOST. At

the same time, the CHED TPSM was cognizant of the fact that some HEIs demonstrated a potential for contributing to nation building efforts. These, however, have not yet attained the expected minimum core competencies for their disciplinary offerings. Thus, CHED came up with the concept for the Centers of Development (CODs).

From 1998 to 2005, CHED supported 14 Centers, with 5 as Centers of Excellence distributed as follows: 3 in the NCR (Ateneo de Manila, De La Salle University, and University of the Philippines Diliman), 1 in Region 4 (UP Los Banos), and 1 in Region 12 (Mindanao State University-IIT). The remaining 9 were Centers of Development located as follows: 2 in the NCR (University of Santo Tomas and UP in Manila), 1 in the CAR (UP in Baguio), 1 in Region 3 (Central Luzon State University), 1 in Region 6 (UP in the Visayas), 2 in Region 7 (University of San Carlos and Silliman University), 1 in Region 10 (Central Mindanao University), and 1 in Region 11 (Ateneo de Davao University). These Centers, in particular, the 5 COEs, produced 49%, 72%, and 76% of the total graduates from all the CHED Centers combined, for the BS, MS, and PhD degrees in Biology, covering the period from 1998 to 2004. The percentage graduate output by CHED Centers as compared to the overall graduation for the same 6-year period came to: 26% for the BS, 64% for the MS, and, 80% for the PhD degrees. What this indicates is that the 14 CHED Centers, representing only 9% of the 150 HEIs that offer BS Biology, produced a quarter of the total graduates. Significantly, the information also indicates that the higher-level manpower (with post graduate degrees) was generated mostly by these Centers.

Another CHED project was the development of Policies and Standards (PS) for Academic Programs in the basic sciences and mathematics. These set minimum criteria for degree programs, providing for specifications, such as, administrator qualifications, teacher qualifications, facilities requirements, among others. The PS for each discipline were developed separately by a group, each constituting a total of 7 policy-recommending Technical Committees for Biology, Chemistry, Environmental Science, Geology, Marine Science, Mathematics, and Physics. The Technical Committees oversee the developmental and curricular needs of each specialized area. The Chairs of each of these Technical Committees sit as members of the TPSM.

The Minimum Policies and Standards (PS) for Bachelor of Science in Biology (BS Biology) is embodied in the CHED Memorandum Order (CMO) No. 24, Series 2005. This document contains a set of Rules and Guidelines "...For the purpose of rationalizing the undergraduate biology education in the country with the end view of keeping apace with the advances in science and the demands of globalization..." A series of orientations was conducted on the PS for the BS Biology program in

several venues in Luzon, Visayas, and Mindanao from 2005–2006. This is because the CMO was to take effect in the first semester of the academic year 2005–2006. (Note that prior to the finalization of the document on the Minimum PS, CHED conducted a series of consultations and leveling off workshops in many parts of the country starting around 1996 until such period when the Technical Committee buckled down to draft the Minimum PS.) This 52-page document signed by the Honorable CHED Chairman, Dr. Carlito S. Puno, on 22 July 2005, ends with Article XX. Transitory Provision, stating that: HEIs with existing program in Bachelor of Science in Biology shall be given a 3-year grace period to comply with these policies and standards.

**The Minimum Policies and Standards are summarized below:**

**A. BS Biology Curriculum: The minimum range in total units per course category**

	Number of units
General Education Courses	39
Non-biology Tool Courses	35
Core Courses	40
Science Electives	24
Free Electives	6
Undergraduate Thesis (or Special Problem)	6 (or 3)
<b>TOTAL UNITS</b>	<b>150 or 147</b>

**B. The minimum units for each category**

	Number of units
1. General Education Courses	39
Language and Humanities	21
Information Technology	3
Social Sciences	12
Life and Works of Rizal	3

Note: Natural Sciences (6 units) and Mathematics (6 units) requirements are fulfilled by General Biology I and II in the Core Courses, Mathematics, Chemistry and Physics in the Non-Biology Tool Courses

2. Non-Biology Tool Courses	35
Chemistry: General, Inorganic, Organic	
Chemistry, Biochemistry	15

Physics: General Physics and Modern Physics	8
Mathematics: College Algebra, Trigonometry, Calculus, and Analytical Geometry, Statistics	12
<hr/>	
<b>Core Courses</b>	<b>40</b>
General Biology I & II (5 units each)	10
Morpho-anatomy I & II (Plant & Animal)	3
Physiology I & II (Plant & Animal)	3
Systematic Biology (Plant or Animal)	3
Developmental Biology (Plant or Animal)	3
Genetics	3
Ecology	3
Microbiology	3
Cell and Molecular Biology	3
Note: Core courses, 3 units each, 2 lec, 1 lab	
<hr/>	
4. Biology Electives	24
Suggested are: Entomology, Evolution, Freshwater Biology, Marine Biology, Molecular Biology and Biotechnology, Immunology, Histology. Theoretical Biology, etc.	
Note: Biotechnology is strongly suggested. Electives however, may concentrate on specific themes that the HEI may choose to offer.	
<hr/>	
5. Free Electives	6
Science, Technology, and Society (3 units) or its equivalent is strongly suggested as a Free Elective	
<hr/>	
6. Undergraduate Thesis or Special Problem	6 3
HEIs may choose between an undergraduate thesis (6 units) and a special problem (3 units) to comply with this requirement	
<hr/>	
Both thesis and special problem options <b>INCLUDE</b> a seminar course, which shall be offered in any of the last 2 semesters/ terms of the program	
<hr/>	

### **CHED National Higher Education Research Agenda (Nhera)**

Recognizing the important role of research in developing higher education in the nation, CHED undertook the National Higher Education Research Agenda (NHERA), which was operationalized in 1998. The Commission offers various forms of financial assistance through this

program by offering block grants, grants-in-aid, commissioned researches, and professorial chairs.

Block grants are available competitively to private and public universities. The institutions receiving this form of assistance have to have a proven track record in research, at least 5% of the total faculty force have earned Ph.D. degrees, existing research facilities with updated computing equipment and updated collection of research journals or easy electronic access to these. Unlike block grants, grants-in-aid are extended to institutions that have lower capacities but show definitive potential in undertaking research. Commissioned researches, on the other hand, are given to individuals or institutions with track record in leadership in the scientific and academic communities and capabilities in these endeavors. In addition, professorial chairs are offered to prominent research faculty who are nominated by their own institutions. The type of researches funded through NHERA is aggregate by nature. The program encompasses all fields and allows an equal opportunity for pursuing developmental goals through research.

If an institution or its academic staff were awarded any of these research grants, counterpart assistance from the recipient universities would be required. The Commission obligates these institutions to allow reduction in teaching load or release time for the faculty researchers and full access to the institution's facilities and other incentives that the institution may provide.

### **Faculty Development Program**

The Faculty Development Program (FDP) is under the CHED flagship project, the Higher Education Development Project (HEDP), which started in 2004. The HEDP is a mechanism to implement some of the sectoral reforms suggested in the 1998 Philippine Education Sector Study of the World Bank and the 2000 Presidential Commission on Education Reform (PCER). The FDP, as a subcomponent of the HEDP, is envisioned to improve the quality of teaching by upgrading the qualifications of the faculty currently teaching in the HEIs. For Biology, there are 13 institutions offering the Masters Program and these are spread from north to south of the Philippines.

### **Selection of CHED COEs/CODs for Biology**

The selection followed the general guidelines and procedures formulated by the TPSM with focus on 4 general criteria:

- **Instructional Quality: Faculty, Curriculum, Administration, Facilities, and**

**Students**

- **Research and Publications: Personnel, Facilities and Equipment, Publications, other scientific activities**
- **Extensions and Linkages**
- **Institutional Qualifications: Mission, Vision, Institutional Policies, Strategies and Principles, Support from Higher Administration.**

**Direction-Setting**

The first selected institutions as the CHED Centers of Excellence and Centers of Development in Biology in 1998 were given a 3-year support to improve the level of instruction, research, and extension, based on the needs these institutions reflected in their proposals submitted to CHED for funding, in accordance with the development concept of the COE/COD Program. In 2006, a new set of HEIs was selected as CHED COEs and CODs in Biology.

The newly awarded CHED COEs and CODs in Science and Mathematics are to perform functions in conjunction with National Priorities. These identified COE/COD Institutions must play a bigger role in Manpower Development, Research and Development, Linkages and Extension Services. They must develop into world-class S&T Universities with the research culture in place, such that more refereed publications are generated and ISI publications would become the norm. This mandate comes with an equally challenging task, which is to popularize science as part of the consciousness of the Filipino people.

**Conclusion**

On our part, we begin with standardizing the BS Biology Curriculum. We consistently strive to instill, early on, a mind set with a research orientation, going beyond mere asking. We continue to self-assess in the light of developments and advances in biology. We participate in programs on (1) the development of a scientific workforce, who shall remain doing their science in the country, (2) massive advocacy and promotional activities, (3) the improvement of educational institutions, and (4) the establishment of science-and-technology-based industries. We thus, benchmark ourselves based on performances and output. We continuously raise the bar!

**About the Author:** Dr. Gilda Carballo Rivero is the Chancellor of the University of the Philippines (UP) Mindanao and Professor of Biology, Institute of Biology, College of Science, UP Diliman. She chairs the Technical Working Group for Molecular Biology and the Technical Panel for Biology of the Commission on Higher Education.



This paper was first presented during the Round Table Discussion on Biology Education which was sponsored by the National Academy of Science and Technology, the Commission on Higher Education, and University of the Philippines Los Baños, held at Trader's Hotel, Manila, 23 April 2007.

### References

Carandang, J.S.R. VI and J.L. Chavez. 2006. Higher Biology Education in the Philippines. (Paper presented during the April 2006 BIOTA Convention, Zamboanga).

CHED Management Information System. 1990–2005. Higher Education Statistical Bulletins. Commission on Higher Education. Pasig City.

Nebres, Bienvenido F. SJ and J.L. Chavez. 2005. Executive Summary. IN: Final Report of CHED Center of Excellence and Center of Development Project for Science and Mathematics. Commission on Higher Education. Pasig City.

Technical Committee for Biology. 2005. Biology Final Report. IN: Final Report of CHED Center of Excellence and Center of Development Project for Science and Mathematics. Commission on Higher Education. Pasig City.