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Remark: This article is offered as a "professional practice" piece. It is an example of what an external reviewer report might look like when a department completes a multi-year reflective assessment of its programs. Names of people and places have been changed and some details modified to protect the anonymity of the original department.

Alpha University Department of Mathematics Five-Year Program Review (May 2010 to May 2014)

Viji K. Sundar

As I begin this report as the external reviewer of Alpha University, I want to express my sincere thanks and appreciation to Dr. Graph and to the Self-Study team for providing a document that is very detailed and comprehensive in the data and analyses needed for assessing the program. Dr. Graph's availability to respond to my calls and emails made this task a joy.

1. Introduction

The mission of Alpha University is to make lifelong learning opportunities accessible, challenging, and relevant to a diverse student population. The core values that shape the mission are quality, differentiation, relevance, affordability, and community. Alpha University's central purpose is to promote continuous learning by offering a diversity of instructional approaches, by encouraging scholarship, by engaging in collaborative community service, and by empowering its constituents to become responsible citizens in an interdependent, pluralistic, global community.

The mission of the Alpha University Department of Mathematics is to provide an outstanding educational experience to undergraduate and graduate students. The degree programs emphasize the development of critical thinking, quantitative skills, and academic and professional integrity to investigate the natural world. The department strives to train students to participate as global citizens with strong communicative, analytical and scientific abilities, while being able to think and cooperate across conceptual disciplines.

The details of the reviewer's findings below will show that there is a good fit between the University's mission and the Department's mission. An online option for the Bachelor of Science Degree in Mathematics was approved in 2013. As of Summer 2015, the Department terminated all on-site offerings of mathematics courses and launched the online Bachelor of Science Degree in Mathematics. The mathematics department's move to an online program merges with its mission "to prepare students to participate as global citizens . . . " and the University's mission "to provide an inclusive and accessible environment . . . supporting students, staff, faculty, and administrators in their work as responsible participants in society."

This report is based on the documentation provided by the Department and a 90-minute interview with mathematics faculty and some students.

2. Strengths

The documentation I received from the Department was thorough. It included:

- Guidelines for Five-Year Program Review, which enabled the reviewer to navigate through the implementation of the self-study;
- Catalog Descriptions of each of the five year's BS in Mathematics program which enabled the reviewer to assess the growth/changes in the program;
- Program Learning Outcomes – not only for the program as a whole but also for all the courses in the catalog, which made the assessment transparent;
- Curriculum Map that is very well laid out in a student friendly table format;
- Multi-Year Assessment Plan (2010-2014) with a matrix for each of the five years indicating the Measure Instrument and Program Learning Outcomes (PLOs);
- The five-year self study plan and the detailed implementation time line (with who/what/when), and the reflective questions and responses;
- The final set of documentation on the entire self-study is quite exhaustive as it included the ten requirements of a self-study.

This is impressive because, only very few campuses do the self-study as methodically and as completely as the Alpha University Department of Mathematics for each year. This self-study committee's Chair had a plan and implemented it decisively and well.

The Mathematics Curriculum

The documentation provided for the Bachelor of Science (BS) in Mathematics has changed since the last review. There is no longer a BS degree in Applied Mathematics. That is welcome to this reviewer as that option – more often than not – tends to take away the theory which is the core of the discipline. On the contrary, the revision has resulted in a much stronger curriculum in both areas, BS in mathematics and BS in mathematics with Single-Subject Mathematics Credential Program (SMCP). The current preparation for the BS in mathematics major has added the courses Numerical Analysis, Abstract Algebra, Functions of Complex Variables, a Mathematics Project Course, Problem Solving Strategies and Methods of Teaching Math. As such, a math major opting for SMCP enters the SMCP subprogram with a stronger foundation of mathematical content. In order to complete the SMCP requirements, the student needs only two additional courses: Student Teaching with Portfolio, and Technology in Math Teaching.

The documentation provided shows a very good alignment of the Department's curriculum and the California Common Core State Standards. Mathematics majors need to be alerted to the connection between the abstract concepts they learn in upper division courses and the secondary school mathematics. The course descriptions provided has several examples of this. For example in the Algebraic Structures course students will learn how homeomorphisms are involved in solving a polynomial equation; in Foundations of Geometry will discuss how non-Euclidean Geometry attempts to describe the physical nature of the universe; in History of Mathematics the students examine how development of mathematical ideas charge the society (e.g. Hindu-Arabic numerals forever altered commerce, navigation and surveying); and in Abstract Algebra the base of coding theory as an application of finite fields.

Program Learning Outcomes

While many campuses across the nation are articulating Program Learning Outcomes (PLOs), the Department has included this in the University catalog. The PLOs have been revised since the last review, not so much in the essence but to make them understandable to prospective students. The reviewer would like to include the PLOs and comment on their merit as the collection of PLOs meets different agencies requirements. The PLOs are indicators of the way the delivery of instruction meets the Standards of Mathematical Practice, which in turn, shows that the BS in Mathematics program complies with the California Common Core Standards.

3. Recommendations

(1) The Department should consider revising the course Methods of Teaching Math in the requirements for the major. Although the course name and course descriptions are appropriate for SMCP program, and the art of "teaching and communicating" is much needed universal skill, it may not be thus understood by a future employer in a corporation.
(2) The Department should consider renaming the courseTechnology in Math Education to something like Technology in Mathematical Sciences and make it a requirement for BS in mathematics.
(3) The reviewer recommends that Advanced Calculus be renamed Real Analysis. The classical and yet fundamental characteristics of Real Numbers - Cantor's Theorem, Heine-Borel Theorem, and Lebesgue Measure to name a few - are subsumed in this course.
(4) The reviewer recommends that the administration provide additional resources to the Department in two areas: (a) provide funds to hire more tutors so students do not have to wait up to a week to get a question answered and (b) provide funds to purchase the needed hardware and special software that directly impacts on the teaching and the student learning. When a Department offers"online courses" in a program it is only prudent to get all the needed technology to make this accessible and inviting. The reviewer is surprised that an "online" program is not equipped to access modern technology.
(5) The reviewer was able to find documentation of Department?s commitment to critical thinking, writing, and communication incorporated in several courses.The reviewer did not see the diversity component or any reference to equity. The reviewer strongly recommends that equity be incorporated. Additional information is available at `http://www.todos-math.org`. The mission of *TODOS: Mathematics for ALL* is to advocate for equity and high quality mathematics education for all students – in particular, Latina/o students.

4. Conclusion

Alpha University's five-year self study report and the interaction the reviewer had with the faculty and students presents the picture of a Department with a BS Degree program that is robust in its curriculum, faculty who are well respected and admired by their students for their teaching style, accessibility and caring. The reviewer was pleasantly surprised at the interaction between faculty and students in an online program. Besides students across the State, the program has a handful of students from abroad who are satisfied with the classes and the format of delivery. There is remarkable move on the part of the campus to "bring the college classroom" to the student. The next move may be to expand the program globally by recruiting teaching faculty from abroad. There is a great possibility both in offerings of courses and the recruiting of students/faculty in the "online" BS in mathematics program.

Addendum to the above Report

The reviewer visited the Alpha University campus. During this visit the reviewer had a face-to-face meeting with Dean Tremblay, Chair Martinez and Professor Graph at Dean Tremblay's Office. The Alpha University team acknowledged that the review was thorough and the recommendations timely and to the point. Dean Tremblay assured the Mathematics Department would be given sufficient funds and resources to follow through with the recommendations. The next step would be for Chair Martinez and Professor Graph to take this to the math department faculty and implement the suggested recommendations as needed.

About the Author

Viji Sundar ⟨vsundar@csustan.edu⟩ is a professor of mathematics at California State University, Stanislaus and is Director of the Central California Mathematics Project. Her professional interests include the preparation and development of mathematics teachers, innovations in teaching and learning in primary, secondary, and post-secondary schools, and lively conversation about these both in print and in person.