

University of Hawaii – Hilo Mathematics Program
External Reviewer’s Report
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Introduction

The UHH Mathematics department has a well-written, detailed self-study that addresses all issues outlined in WSCUC guidelines. This external review of the mathematics program is based on the self-study document and virtual zoom interviews with various members of the university community, including faculty, department heads, and administrators. A physical campus visit was not plausible during this year due to the COVID-19 global pandemic. Summary of the common themes in information obtained from the self-study and interviews are included in this report. They provide the foundation for the evaluation of the accomplishments and strengths of the mathematics program as well as suggestions for growth and improvement.

I want to express my great thanks and appreciation to all members of the UHH community for their graciousness, insights, commentary, analysis, and conversations. I experienced a fine sense of community, sharing, and openness through my virtual visit, and I greatly appreciate the insights and perspective of all I interviewed.

The virtual interviews revealed that the Mathematics department is an appreciated and valued entity of the university. The department has an excellent reputation for being collaborative and exceptionally collegial working with the administration and other departments. The department is willing to embrace change and transformation to further its mission. The faculty possess extraordinary credentials but also care about students and their academic success. These notable characteristics are instrumental in sustaining, improving, and growing an already thriving department.

The mission of the Mathematics department is threefold: (1) develop an appreciation of the discipline in its majors and prepare them for successful careers in graduate school and secondary education, (2) support other disciplines that rely heavily on mathematical content, and (3) service non-science majors by introducing them to fundamental concepts of mathematics.

My suggestions to advance the mission of the Mathematics department pertain to curriculum, faculty, and community outreach. My recommendations include analysis of the efficacy of the Mathematics Placement Test, expanding the Data Science Certificate into a degree program, adding a capstone course, revamping the mathematics minor, developing 4+1 Mathematics Education program agreements with MA in Teaching graduate schools, increase professional development opportunities, and intensify community outreach and recruitment efforts.

In the following paragraphs, I describe the progress and accomplishments of the Mathematics department over the last ten years followed by suggestions for improvement and growth.

Progress, Accomplishments, and Present Mathematics Program

Based on the Mathematics department's action plan developed from the reviewer's suggestions in the 2012 report, the Mathematics department engaged in developing the co-requisite model MATH 135T Pre-Calculus Functions course with a just-in-time review of concepts from MATH 103 College Algebra. It also developed a Mathematics Placement Test to properly place students in mathematics courses, expanded by adding a Data Science certificate and a statistics faculty member, improved teaching classrooms, modernized Calculus labs, and upgraded to using CoCalc as its software platform for the Calculus sequence. The amount of progress and improvements the department has made in the last ten years is remarkable. The department did an outstanding job in completing and reaching the goals articulated in its action plan.

Students

The students at UHH are provided an excellent mathematics curriculum. They are encouraged to be involved in co-curricular activities such as internships and REUs. They also have an excellent opportunity to be a part of the interdisciplinary and rigorous Honors STEM Certificate program. This is particularly commendable as many mathematics departments concentrate their efforts on general education and service course retention; however, this department provides tremendous opportunities for their advanced and exceptional students. Graduates of the mathematics program continue to be extraordinarily successful in graduate school and teaching. Most notably, graduates have received the NSF Graduate Research Fellowship, completed the prestigious international "Semester in Mathematics in Budapest", and attended Summer Research Institutes at Ivy League schools. Once a student decides to major in mathematics, they have an outstanding track record of persistence to degree completion. Students involved in the distinguished S-STEM program also have an outstanding retention rate.

Major curriculum

The UHH Mathematics department implemented some important curriculum changes. First, to resolve the bottleneck problem of providing one course as the gateway to upper-level mathematics courses, the department now provides other courses as a gateway which lessens the bottleneck issue. The Mathematics department also greatly improved its assessment of courses. The detailed assessments of their courses are exemplary and will help guide decisions on how to improve its programs. The program incorporates technology in its curriculum, designating CoCalc as its technology platform for the Calculus sequence. The Mathematics Education program is an important major in fulfilling the department's mission of developing secondary education instructors and serving the Hilo community.

Statistics Education

The Mathematics department hired a statistics faculty member and the department is now part of the interdisciplinary and collaborative Data Science certificate housed in the Computer Science department. This certificate is vital in fulfilling the department's mission of preparing students for successful careers in mathematics-related fields.

Service Curriculum

To better serve other departments, the Mathematics department developed a type of corequisite model general education course by adding a tutorial section of the Math 135 Precalculus Functions. Corequisite models are currently considered best practices in mathematics curriculum to support the retention and persistence of students who need remediation. The department also developed its own Mathematics Placement Test, modifying it as needed. The very thorough assessment of service courses is admirable.

Faculty

UHH has mathematics faculty with remarkable academic credentials, especially in scholarship. Faculty members in the department have either been PIs or Co-PIs on significant grants such as the NSF EPSCoR and S-Stem grants. Both grants provide excellent opportunities and support for the academic success of UHH students. Furthermore, although the department lost a few faculty members it acquired a statistics professor.

Community outreach

The Mathematics department may want to enhance its outreach and recruitment efforts. Involvement in K-12 public schools and informing high school students of the career opportunities involving mathematics, mathematics education, and data science may increase the number of majors in the department.

The UHH Mathematics department has done tremendous work and made significant progress over the last ten years. Even so, I hope the following suggestions for improvement and growth will facilitate the continued progress of the department.

Suggestions for Improvement and Growth

(1) Service courses

Developmental Mathematics Program

Studies show that correct mathematics placement of students in general education courses improves success and retention rates. Since the department has developed a Mathematics Placement Test, the department might want to continue to collect and analyze data about its effectiveness. Assessment of student success in the sub-sequential mathematics courses might help make improvements to the efficacy of the placement test.

Statistics Education

Since the department has established a Data Science certificate, I suggest continuing to add statistics courses and perhaps another applied Mathematics faculty to expand this certificate into a bachelor's degree in Data Science. As part of this expansion and growth, creating an advisory board consisting of faculty and local industry representatives would help build a bachelor's degree in Data Science. Thus, the graduates of this program will have the skill sets preferred by local companies and industries.

(2) Program and courses for majors and minors

Major Curriculum

Although the Mathematics department provides opportunities for their students to do undergraduate research, it is voluntary and not a degree requirement for the program. Thus, to address the ALO recommendations of improving assessment in the department for writing and communicating mathematics, the department may want to include a type of capstone course in its required curriculum. This is a common overall assessment included in mathematics programs and is considered best practice in mathematics assessment. In such a course, students have an opportunity to display and synthesize what they have learned as an undergraduate. Through the activity of researching and conveying their findings both in written and oral forms provides a comprehensive assessment of a mathematics program.

Minor Curriculum

In most universities, the number of credit hours required for a Mathematics minor is between 18 and 21 hours. As the minor in Mathematics at UHH requires 26 credit hours, the Mathematics minor curriculum may need to be reviewed and modified. This could perhaps be done by requiring the current four calculus courses and six credit hours upper-division mathematics-related electives or require only three calculus courses and nine credit hours upper-division mathematics-related electives.

Mathematics Education

Having a Mathematics Education track for secondary school teaching is an important program that is vital to its students and the Hilo community. Mathematics teachers are always in demand. Since the Mathematics department does not have a full accredited Mathematics Education degree program, the department may want to consider 4+1 program agreements with institutions that provide an MA in Teaching, including UHH. The pre-requisites for these programs include contact hours tutoring students, PRAXIS II competency, and a required GPA. Thus, the department might want to revamp the current MATH 496 to meet the tutoring requirement and develop an online Praxis II Prep course using computer software aligned with preparation for the test. Also, the department may want to consider a mathematics education course that covers pedagogical methods in teaching Geometry, Algebra, Trigonometry, and Statistics. The department may also want their Mathematics Education track students to take electives in the Education department.

(3) Faculty

For the Mathematics department to grow and expand, a tenure-track assistant professor position is warranted. Since it has been suggested that the Data Science certificate should expand into a bachelor's degree, another faculty member in statistics would be necessary. Also, to develop the Mathematics Education track to align with 4+1 agreements with MA in Teaching graduate programs, another faculty member in mathematics education would

be beneficial in instigating and managing this endeavor. Thus, in either case, for growth and improvement in the department, another tenure-track faculty position is necessary.

Professional development

Because UHH is located on an island, professional development for mathematics faculty is not readily accessible. However, during the global pandemic, professional development was delivered through virtual mediums. Now, professional development for mathematics faculty may be provided in virtual forms. If so, it is important for faculty to keep current with the best practices of mathematics instruction by registering for online professional development. The institution and administration may also consider providing professional development opportunities by creating a Center for Excellence in Teaching and Learning (CETL) whose purpose is to provide professional development opportunities for university faculty.

(4) Recruitment

Most students who graduate from UHH with a degree in Mathematics matriculate from other degree programs sometime after their initial semester. So, entering freshmen are not declaring mathematics as their major of choice but change their major to mathematics after some time. Thus, there is a need to improve involvement and recruitment efforts targeting high school students. Most high school students are unfamiliar with careers that are available with a mathematics degree except for teaching. Educating them on the many career opportunities associated with a mathematics degree and also introducing them to fascinating mathematical concepts is crucial. Some universities' outreach efforts include such events as Science Day and Pi Day. Other universities host mathematics competitions for high school students and, as part of the activities, engage and educate them about the wonderful careers that will be available to them by majoring in mathematics.

In conclusion, after reading the self-study and completing the interviews, it is clear that the UHH Mathematics department is an impressive, thriving department. I hope this external review will facilitate the forward progress of an already exemplary mathematics program.