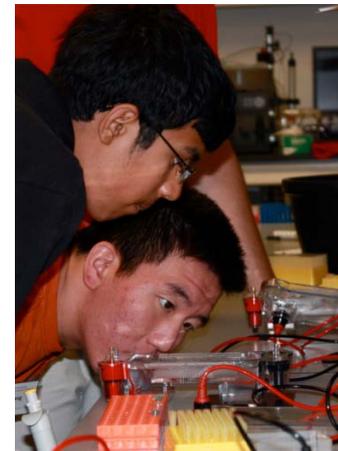


Integration of Standards, Models of Standardization and Science Policy for the 21st Century Biotechnology Workforce



**NIST 5th Standards Education Workshop
November 2, 2017**

Overview of UH Biotechnology Program

Mission

- The Biotechnology degree program provides students with strong core science concepts and an application-oriented undergraduate and graduate education.

Objectives

- Prepare students for employment opportunities in the critically important and dynamic biotechnology industry.
- Instruct students in a core set of skills that span across basic sciences, technology, engineering, and mathematics (STEM) education.
- Integrate bioprocessing, bioinformatics and environmental biotechnology into an undergraduate and graduate curriculum.

Significant Accomplishments

Designed, developed and implemented Standards course into Biotechnology (BTEC) graduate curriculum.

- Course is open to all UH graduates and continuing education participants
- Fully online through UH Blackboard system
- BTEC 6300: Introduction to Standards in Biotechnology first offered in Fall 2016

| M.S. Engineering Technology (31/34 hours) Biotechnology Track | |
|---|-----------------------|
| Core Courses: (7 hours) | Hours (7) |
| BTEC 6100: Seminar in Biotechnology | 1 |
| TECH 6360: Experimental Design and Data Analysis | 3 |
| TEPM 6301: Project Management Principles | 3 |
| Required Courses: (Choose 18 hours)* | Hours (18) |
| BTEC 6300: Standards in Biotechnology BTEC 6101: Biotechnology Techniques and Methods BTEC 6302: Introduction to Regulatory Affairs BTEC 6303: Protein Engineering Technology BTEC 6304: Computational Methods in Biotechnology BTEC 6397: Selected Topics in Biotechnology BTEC 6401: Bioprocessing in Biotechnology (2) approved non-BTEC electives | |
| Research: Choose Thesis (6 hours) or Project (9 hours) | Hours (6 or 9) |

Sharing of project information among stakeholders

- Conference calls with project personnel and consultants during development and implementation phase
- Project manager and BTEC faculty discussion of course content at the end of semester
 - ❖ Class surveys and discussion board provide feedback on how content can be improved

Dissemination of project information

- Online through College of Technology and CLiST web portal
- Printed promotional materials

Effectiveness of communication plan

- Course enrollment is high among BTEC graduates with all current students either enrolled or planning to enroll in the course next year
- Graduate students in the Natural Sciences and Mathematics and Civil and Environmental Engineering Colleges have expressed interest as an elective
- Industrial participation is lower than desired and will be a major focus

Communication Plan - Summary Paper

Project results are planned to be released to the public through publication in the journal American Society for Engineering Education (ASEE).

- Spring 2018
- This report will be approximately 10 pages in length
- Detail project goals, outcomes, evaluations and lessons learned through the activity

Project Evaluation

Participant -> Content interaction

- Online lectures, quizzes, weekly assignments, exams, and written projects.

Participant -> Participant interaction

- Group tools such as the discussion boards and biweekly topics provided to the group by the instructor

Participant -> Instructor interaction

- Email and surveys that allow students to directly comment on necessary course material or supplementary information following the completion of each module.
 - ❖ Fall 2016 class feedback suggested that content was biomanufacturing heavy
 - ❖ Supplemented with standardization discussion and activities involving the analysis and reporting of biological data
 - More inclusive to bioinformatics focused students
 - Increased student interactivity

Project Outcomes

We succeeded in our overall goal to offer a new introductory course in standards education to the BTEC graduate curriculum.

- To date a total of 10 graduate students have enrolled in the new course
 - ❖ With enrollment in the BTEC graduate program expected to grow significantly in the next year and increased visibility and interest of the course within the UH system we expect course enrollement in Fall 2018 to effectively double to 10-15 students

- A series of lecture slides, instructional videos, bioinformatics datasets and testing materials has been created as part of course development.

- New course impacts not only the UH system, but also the Texas biotechnology industry
 - ❖ Continuing education

Lessons Learned

We have found that:

consistent feedback from students is critical for keeping course content fresh and ensuring that broad student interests are addressed in the course.

- surveys
- online discussion

promotional materials should be distributed with as wide a net as possible

- print
- online
- social media
- in class discussion with undergraduates looking to attend graduate school

generating interest outside academia can be a challenge.

- working alumni can be used to make inroads in industry and bring in new participants

Future and Continuing Plans

1.) Continue to disseminate promotional materials across UH system.

- Update CLiST web portal
- Target graduates part of Natural Sciences and Mathematics and Civil and Environmental Engineering

2.) Increase outreach with industry partners to disseminate information on Standards course and increase industrial enrollment and participation.

- New advisory board
- Survey BTEC alumni

3. Develop 3 course regulatory track within BTEC graduate program.

- BTEC 6300 Introduction to standards in biotechnology
- BTEC 6302 Introduction to Regulatory Affairs
- BTEC 6304 Computational Methods in Biotechnology or BTEC 6401 Principles of Bioprocessing

Acknowledgments and Contact Information

We wish to thank NIST for their support in bringing this project to fruition.

Please direct all project inquiries to the project manager.

Dr. Rupa Iyer
riyer@uh.edu
713-743-0099