Annual Report for Assessment of Outcomes 2011-2012

Submitted: June 28, 2012

SAC: Bioscience Technology (BIT)

Outcomes Assessed: Bioscience Technology AAS

1. Describe changes that have been implemented towards improving students' attainment of outcomes that resulted from outcome assessments carried out in 2010-2011.

   - 2010-2011 Assessment Outcome 1: *Apply knowledge of safety principles required to work in a bioscience laboratory or manufacturing environment.*

     - One of the difficulties in teaching safety in 2010-2011 was that it was part of a larger course (BIT110) that included a multitude of topics, only one of which was safety. In this format, students were given a large amount of relatively dry information in a very short time and the topic was not formally discussed after that (although safety is always part of any laboratory session/discussion). This did not seem to be the best way to adequately prepare students to address laboratory safety on a constant/consistent basis.

     - In order to more adequately prepare students in the area of laboratory safety, all students are now required to take BIT105 (Bioscience Laboratory Safety) which consists of 20 hours of instruction (2 hours per week for 10 weeks) on proper handling and disposal of chemicals, knowledge and understanding of MSDS content, and many other relevant issues related to biological and chemical laboratory safety. In one part of this course students take a tour of the lab and are instructed and tested on finding areas that need improvement with regard to safety. Since students take this course for an entire quarter, there appears to be more retention of safety information, especially with regard to use and understanding of MSDS paperwork for proper handling and disposal of chemicals. Additionally, it is now easier to emphasize all aspects of laboratory safety knowing that all students are required to take (and pass) BIT105 as a prerequisite to all BIT laboratory classes.

   - 2010-2011 Assessment Outcome 2: *Carry out routine laboratory tasks and commonly used techniques with confidence, quality and appropriate documentation in a bioscience environment. **Note**: this also maps to Core Outcome Professional Competence and Communication.*

     - Based on what we learned from these assessments, practical exams have been integrated all of the BIT laboratory courses, including BIT109 (the first BIT laboratory course) in order to more closely monitor individual students and allow

time for intervention and remediation when necessary. We plan is to continue using these practical skills assessments in all BIT courses in the future. One extremely valuable aspect of the practical exams is that it helps students self-assess their progress and their laboratory skills. It also serves as a good platform for one-on-one discussions with students about their performance and skill level compared to what will be expected in various laboratory environments. This also serves as a good opening for discussions regarding what types of jobs are appropriate based on student performance on the practical exams.

- 2010-2011 Assessment Outcome 3: *Apply knowledge of measurement and assay principles and strategies, purification principles, and the scientific method to laboratory situations.*

    - This assessment was very valuable because it highlighted which skills were acquired by all students and which were not. In addition, this assessment clearly pointed out that many students have a difficult time with assays while doing quite well on protein purification in general. Based on these observations, students are now required to perform a variety of assays much earlier in their laboratory classes, and these are done individually instead of with lab partners. Additionally, more time and emphasis is placed on performing the critical assays for protein purification prior to starting any work on protein purification. Based on a repeat of this assessment in the class this year it seems clear that this strategy has helped students to become more proficient at performing routine laboratory assays.

- 2010-2011 Assessment Outcome 4: *Apply principles learned in courses to trouble shoot laboratory and manufacturing problems and devise and execute appropriate solution.*

    - This assessment demonstrated that students weren't learning enough about bioscience manufacturing environments. To remedy this, we have developed a new course, BIT126, which is a hands-on course focused on training students how to work in a regulated work environment which will more adequately address issues associated with working in bioscience manufacturing. Additionally, the lead bioscience instructor will participate in a hands-on training called "Biomanufacturing Bootcamp" in the summer of 2012 in order to learn more about the subject and integrate it more thoroughly throughout the curriculum including BIT109 and other courses.

- 2010-2011 Assessment Outcome 5: *Plan and organize tasks to allow efficient completion of complex procedures, including planning and executing multiple procedures that proceed simultaneously. Coordinate with others to work as part of a team.*

    - This assessment demonstrated that students weren't very good at multitasking which is a crucial skill for those working in a laboratory but a difficult skill to acquire. BIT classes require students to learn organization and multitasking skills and this is done on a daily basis in most classes. For experiments that require multitasking and extreme organization, students are now asked to work together to develop a timeline

that is put on the board to follow and "check off" as tasks are done and others are started. This has provided a good basis for students learning to follow their outline and keep on task when there are multiple things that need to be done simultaneously in the lab.

- To place more emphasis on how crucial teamwork is to students entering the workforce, one class period (4.5 hours) in BIT203 at the beginning of the term was devoted to teamwork. We had an outside expert from a local bioscience company give a presentation/workshop to students covering teamwork and cooperation. Students worked in groups and did in-class exercises as part of the workshop. Overall it seemed to be a very positive experience and it was helpful to have someone from human resources in a bioscience company emphasize the importance of teamwork and cooperation in the workplace. As part of the teamwork exercise, students in the BIT203 class rotated every week to work with different lab partners in order to learn to work together with people with different skill levels and personalities. Overall this was successful although it was logistically difficult with a large class.

2. Outcomes assessed this year. We assessed parts of Outcome 1 (b, c, and d) that were not assessed in the 2011 report. We also assessed Outcome 6 and the core outcomes of Cultural Awareness and Self Reflection for this 2011-2012 report.

- <u>Outcome 1 (parts b, c, d) : Apply knowledge of quality and regulatory issues, teamwork and good business practices to work in a bioscience laboratory or manufacturing environment</u>.

a. *Method used*:

- Rubric assessment of term-long project presentation that was presented by the students towards the end of the term and graded by the instructor using the attached rubric (see Excel attachment). The rubric assessed student knowledge and understanding of three key areas: design inputs and outputs, SOPs, and customer complaints. Students worked on these projects as part of a team consisting of 3-5 students per team. All teams and all students were assessed using the rubric. There was only one class and one instructor to evaluate these students. Students were marked as to which student addressed which issue and comments were provided for each student and team in the comments section.

b. *Results: What did we learn?*

- Most students (18/20) did very well on the presentation and were considered to be both knowledgeable of the subject matter and prepared for the presentation. Students who did not perform well were generally those that missed classes and didn't participate well as part of their teams. The presentation was worth 20% of the final grade for the course.

c. *Changes to be implemented as a result of this assessment:*

- Most students did very well in this assessment with the exception of one or two who didn't perform appropriately as members of a team. Since teamwork is such a crucial aspect of working in a bioscience environment, especially in the context outlined in the class projects, we intervened by bringing in an outside expert from a local bioscience company to give a presentation/workshop to students covering teamwork and cooperation. This was done the following quarter in the BIT203 class but in the future it will be incorporated into the BIT125 or BIT126 classes where students routinely work in larger groups to do term-long projects. The teamwork workshop seemed to be a very positive experience and it was helpful to have someone from human resources in a bioscience company emphasize the importance of teamwork and cooperation in the workplace.

- Other changes to be implemented include the creation of a new course (BIT126) designed specifically to teach students more hands-on skills and documentation required to work in a regulated bioscience environment. Aspects of this project will be expanded on in the new course with students working as part of a team in a term-long project that is not just theoretical, but which they will work on in the bioscience laboratory. Future assessment of these outcomes will be done in BIT126 and will cover aspects of the term-long project to assess student achievement in all of these areas.

- <u>Outcome 6: Effectively, clearly and succinctly communicate the procedures, results and interpretations of laboratory activities to other staff in the bioscience workplace, using both informal and formal forms of scientific communication, including casual conference, the laboratory notebook, forms, memoranda, written reports and formal presentations</u>.

a. *Method used:*

- All students in BIT 280a/b (work experience and seminar) are required to provide a weekly written summary of the work they perform in their host laboratory for that week. The written summary requires students to describe the knowledge and skills learned in the work environment and effectively communicate that in an informal report with a required weekly deadline.

- All students in BIT 280a/b (work experience and seminar) are required to give an oral presentation to the BIT280b instructor and all students in the course as a final project/capstone to their summer work experience. The presentation requires students to communicate their knowledge of a specific project including scientific background and techniques that represent their summer work experience to their peers.

- Students are evaluated by their work experience supervisor(s) using a ranked evaluation form that lists various aspects of work performance including work attitude, relations with others, attendance, job learning/skill improvement, quality

of work, appearance, and specific questions addressing student learning objectives. The mentor/supervisor discusses the written evaluation with the student at the end of the work experience. Additionally, the evaluation and student strengths and weaknesses are discussed between student and BIT280b instructor at the end of the work experience.

b. *What did we learn?*

- Student weekly summaries clearly showed that most of the students could take their work and translate the skills learned into both informal and formal forms of scientific communication. This assessment also helped identify the strong and weak points of communication in the assessed student group.

- With the understanding that each student has a different work experience/environment, the overall supervisor assessments illustrated that most students communicated effectively in the course of their work experience. One exception was a student with severe communication issues who, in spite of this, clearly made significant progress in communicating with others in her work experience environment.

c. *Changes to be implemented as a result of this assessment:*

- Currently and in the future, students are counseled by BIT faculty at the end of the program (before beginning their work experience) on their specific strengths and weaknesses in both their laboratory and communication skills in order to help ensure their future success in the bioscience industry.

- <u>Core Outcome – Cultural Awareness</u>

a. *Method used:*

- 9 students (all of the students in the class) in BIT215 Protein Purification class were asked to participate in a cultural exchange program with a group of 20 Japanese students from our "sister college" Osaka College of High Technology in Osaka, Japan. The program included two days with our students interacting closely with the Japanese students for scientific seminars, presentations, group games, and a laboratory exercise to purify Green Fluorescent Protein in the Bioscience Technology Laboratory. The lab experiment was performed in small groups consisting of one PCC Bioscience student and 2-3 Japanese students in each group. The Japanese students spoke little or no English and it was a challenge for students from both groups to effectively communicate and perform the experiment successfully. After the cultural exchange, students were asked to write and submit a brief statement on how the time spent in the classroom with the Japanese students affected them and their cultural awareness.

b. *Results: What did we learn?*

- This assessment was very valuable because it focused on the student's point of view and showed the value of bringing together people of different cultures. It was clear that students gained a much greater awareness of communicating with people who don't speak their language and they did extremely well with this. Some quotes from three different students include:

  "The cultural exchange with the students from Japan went differently than I had expected it to. I had been expecting a nerve-wracking experience on all accounts, due to the language barrier, but as it turns out, everyone was obviously having a great time. The two students I worked with knew very little English, and I know almost no Japanese, but somehow, we were able to get our work done efficiently".

  "While the language barrier was strong, it was still possible to successfully relay instructions as well as share interests, and cultural differences. The experience did highlight the differences between our cultures, but that was expected. What I truly enjoyed was the similarities and the ability to share laughter despite the obstacle that the language barrier presented."

  "I found the time we spent with the Japanese students to be an enlightening experience for me. I was nervous going in because I did not see how we would be able to interact and do a lab without being able to communicate verbally. But, after spending some time with them, it was obvious they were just like us....laughing and joking with each other, having fun and taking pictures with us....despite our cultural differences. The language barrier wasn't even a problem. I feel if I am ever put in a similar situation, I will definitely feel more comfortable than I did before, and I appreciate that we had that opportunity."

c. *Changes to be implemented as a result of this assessment:*

- We will incorporate similar cultural exchanges in the program in the future whenever possible. Additionally, it will be important to try to discuss the global impact of biotechnology in the newly created BIT102 class (Current Topics in Bioscience Technology).

- <u>Core Outcome – Self Reflection</u>

a. *Method used:*

- 15 students (all of the students in the class) in BIT109 Basic Lab Techniques and Instruments were asked to write a "self evaluation" as part of their final exam. The instructions are outlined below:
  - List all lab skills, industry specific knowledge and information gathering skills you have learned and/or practiced this term.

- Choose 10 of the items in your list from part A that you think are the most important for you in your job search, and for each of the 10, describe how that particular skill or knowledge would be used in a bioscience tech workplace.
- Do a self-evaluation of your own strengths and weaknesses and discuss how you can apply this knowledge to be successful in identifying the best fit in a job.
- Do a similar self evaluation of your skill level in the lab after one quarter in the program. Choose 2-3 specific skills that you will focus on improving over the next quarter. Describe specifically how you will work on improving in these areas.
- What are your short-term and long-term goals and how does what you have learned so far in the program fit into these goals?

b. *Results: What did we learn?*

- This assessment was very useful as a starting point to individually discuss strengths and weaknesses with each student. In general, students are aware of some of their weaknesses and this self-reflection allowed them to openly and honestly discuss their strengths and weaknesses. As an instructor, the self-evaluation made it much easier to be able to highlight the positive progress each student had made and discuss the areas that still needed work. Because the students had reflected honestly, the discussions were very positive and still allowed the instructor to point out areas of weakness to focus on for the remainder of the program.

c. *Changes to be implemented as a result of this assessment:*

- This "self reflection" and assessment will be incorporated into the BIT109 course in the future since it is best to do these assessments while there is ample time to correct and improve habits. Additionally, at the end of every year, an individual consultation is done with each student to help guide them as they enter the workforce and to highlight the areas that still need improvement in the future.

Overall Assessment Summary:

We continue to learn a great deal from our assessment of students using the tools put in place over the last two years. This has allowed us to make significant changes to curriculum, teaching methods, and assessment tools. In particular, incorporating practical exams into all of the laboratory courses has allowed us to closely monitor the skills and progress of individual students even when most usually work as part of a larger team. Another benefit of the practical exams is that students seem to be able to better self-assess in our classes based on practical exam results. Where written exam results rely on studying, practical exams highlight student laboratory skills that they can't study for and more accurately reflect the expectations they will find in their future work environments.

Design Inputs/Outputs
Presentation
11/01/11

Design Criteria Team & Name	Introduction	Design Function	Design Performance	Design Risk	Design Safety	Design Regulatory	Design Statuatory
TEAM 1: Fexi-Splint;/Medical Device. Flexible product to facilitate healing of fingers & toes. Splint.	**Company Name: OFS Medical Device**						
Student 1	X						
Student 2					X		
Student 3		X					
Student 4			X				
TEAM 2: Clarity KC/Medical Device; Mitigate vision loss associated Keratoconus. Contact Lens	**Company Name: Clarity**						
Student 1							
Student 2			X		X		
Student 3							
Student 4							
Student 5	X	X					
TEAM 3: Neurofit/Drug; Regenerate nerve cells in the brain via chemicals derived from nicotine. Dosage is with pill	**Company Name: G-Med**						
Student 1							
Student 2					X		
Student 3	X	X					
Student 4			X				
Student 5							
TEAM 4: Ecol-Eye/Neither Medical Device or Drug; Interpet negative and positive presence of ecoli and reprocussion	**Company Name: JebJoba**						
Student 1	X						
Student 2		X	X		X		

Student 3	X						
TEAM 5:Neurosense/Medical Device; Collection of brain fluid to determine schizophrenia	**Company Name: NeuroLife**						
Student 1							
Student 2	**X**		X				
Student 3	X				X		
Student 4	X	X					

Design Inputs/Outputs
Presentation
11/01/11

Design Essential Requirements	**Design Inputs & Outputs Exercise**	Comment About Presentation
		Outputs to include industry standards
		Introduction: Aluminum alloy with foam digits
X		Essential Requirement: Size Safety: Vendor specification
		Performance: Easy to clean
X		Essential Requirement: permeability-transmittance test. Material - gas permeable/flexible
		Performance: Comfort for 10 hours per day. Safety: Sterile lens and solution.
X		Business: 10% ROI
X		Essential Requirement: permeability-transmittance test. Material - gas permeable/flexible
		Rigid gas permeable silicone fused contact lens. Function: Proper lens fitting
	X	Essential Requirements: Cost/Material
		Safety: No headaches
		Function: Addressed intended use. Note: Was not ready for presentation
		Performance: Real time stability of product
		? - Preparedness
		Function: Addressed intended use. Performance: Ease of use. Low level cell detection Safety: No false readings

Design Inputs/Outputs
Presentation
11/01/11

		Excellent Intro Presentation about product with spin on marketing side
	X	Esstential Requirement: Small enough to wear
		Performance: Attach and detach within 2 minutes
		Safety: Collect No more than 2 micro liters brain fluid at one time
		Breakthrough in microdialysis. Collecion of multiple samples over 500 hours. Function: 500 hours intended use.Excellent Team Presentation