Shoreline Community College
16101 Greenwood Avenue North
Shoreline, WA 98133

Biotech Advisory Meeting Minutes

Monday, March 4, 2019
10:00-11:30 am. Room 9201, Building 9000 ["the PUB"]

Meeting Attendees

Shoreline Community College: Dina Kovarik, Jan Chalupny, Guy Hamilton, Sandra Porter (also of Digital World Biology), Louise Petruzzella, Jim Schulz and Reitha Weeks

Industry Representatives: Susan Julien, Joy Adiletta, Arthur Castleton, Todd Smith (guest), Jon Digel, Roshan Liyange, Mark Parrish, Don Sodora, Nick Geisse, Ad Legesse, Meg O'Conor (by phone).

1. Introductions and Approve Minutes from the November 7, 2018 Meeting

Mark moved to approve the minutes, which was seconded by Reitha. All approved.

2. Board request: Summery of information that arose from the Program Overview activity at the November 7, 2018 meeting

At the November, 2018 meeting, Board members and staff reviewed the current course offerings as well as the new courses being developed as part of the NSF grant to determine:

a. Which courses should be included as part of the general Biotechnology Certificate and degree
b. Which courses should be included as part of the new Immunobiotechnology Certificate [in development]
c. Which courses might be interest to high school students, possibly as part of a new accelerated high school Biotechnology track, or at least to include in the first year of their studies at Shoreline to engage them earlier with the program. Currently students do not begin their Biotech courses until year two.

Major findings:

- There was consensus that BIOL 266: Media and Solutions II in winter term should formally become Introduction to Biomanufacturing, and this course should be required class for all students.
- There were multiple suggestions of courses that would be appealing to high school students, and may be part of an accelerated pathway, including Media and Solutions I, Basics of Bioinformatics and Case Studies in Drug Development, but there was no consensus. Guy noted that keeping these courses at 2 credits each [i.e., 5 weeks] is preferred for Running Start students, which would mean that the College gets paid tuition by the State and the local school districts don't lose those FTEs.
- There was discussion about the Quality Control / Quality Assurance class [being developed as part of the NSF grant]. Additional discussion is needed to determine if this will be two courses or

one. At the present time it is proposed as one 5-week course and will include many of the topics identified by the Board at the May 11, 2017 meeting.

- Adding additional courses to spring term without taking a course away would be especially challenging given the current work load of Immunology and Tissue Culture.
- Some classes may need to be re-ordered.
- The addition of a second cohort would provide additional class scheduled times to add electives (i.e., one elective could be offered in the afternoon and a different one in the evening). For "core" courses like Molecular Biology and Immunology, there would be an afternoon lab section and an evening lab section, and all students would be in the same lecture section.
- Guy noted that a new STEM building is anticipated to be approved by the State by July 1 and would have Biotech space. The construction timeline is 2.5 years.

3. Cohort & Program Updates (see Appendix, provided to Board as a handout)

a. Biotechnology Cohort Updates

Dina distributed a handout about student cohorts, students seeking employment, and the most recent certificate/degree information anticipated through 2021. See the Appendix at the end of the minutes for the handout provided to Board members summarizing the status of former, current and prospective cohorts.

b. Project Biotech Summer Camps

Reitha Weeks rweeks@shoreline.edu talked about the handout on the 2019 Biotech Summer Camps. Registration is $450 and registrants can request a scholarship which are provided by industry sponsorships [many of which are made possible by Board members in the room, so thank you!] as well as partnerships with local School Districts who provide financial assistance [Edmonds, Everett and Northshore]. We have 36 Registrations for 72 spots. Topics this year include "Biotechnology Essentials and Beyond," "Tracking Hantavirus in Washington State," and "Cancer Biology."

Because of the snow-related high school closures, camp dates will need to be delayed / postponed [starting July 8 instead of June 24]. Both camp sponsorships and tours for 12-24 students each are still needed.

The Board asked how many students return from previous years or participate in multiple camps. Approximately 4-6 students participate in all 3 camps, 4-6 participate in 2 camps, and 4-5 alumni return each year.

c. Thank you to Board Members!

Thank you to all of the Board members who have participated (or plan to participate) in PROJECT BIOTECH, host tours of their companies, and guest lecture in the Biotech classes, and participate in Career Panels. You are making a lasting impact on our students and campers!

d. National Science Foundation Update

This was largely covered above under Item 2.

- Media & Solutions II will become Introduction to Biomanufacturing
- The new Advanced Bioinformatics course is coming along very well
- The new Cancer Biology course will be discussed below
- There is still no consensus on when new classes will be offered [except for Introduction to Biomanufacturing], in part because the course order must be revised and in part because some of course offerings depend on a second cohort.
- The Board asked if the College 'breaks even' on a full cohort. The answer is yes, in part by running as lean of a program as possible, and in part by the generous donations of Board members and other local companies of equipment, disposables or consumable items. We are always looking for tips, tubes, and media. Items not used by the program are donated to local high schools.

e. NIIBML grant to prepare students for work in biomanufacturing

The NIIBML [the National Institute for Innovation in Biomanufacturing Biophamaceuticals] grant awarded to Shoreline Community College and Juno Therapeutics aims to prepare students for work in biomanufacturing. Louise Petruzzella is the project manager. Louise noted that the award should begin May 1. It is a $100,000 matching grant [half from NIIMBL and half from Juno] and will continue over the summer with 3 focus groups to inform the creation of stackable credentials, which certify the completion of certain competencies while completing a particular course (such as tissue culture or sterile technique). Ask if you would like to be part of the focus groups.

4. Request for Tours: Spring and Summer

Louise: We would like students to have at least one tour in spring, possibly two. Tours average 12 students each (16-18 if the site permits, in which case we invite prospective students and recent alumni), as did when we toured AGC Biologics earlier this year. Goal: April/May on a Friday. Don Sodoro and Jon Digel volunteered for spring, Adhanom and Richard Moran at Seattle Genetics this summer.

5. Planning and Workshop Session: New Cancer Biology Course

The goal of the working session was to receive Board feedback on the new Cancer Biology course being developed as part of the NSF grant. Board members were provided a draft of the "Cancer Biology Course Outline" and a "Cancer Biology Course Outline Board Feedback Form" [both can be found in the Appendix]. The proposed 5-week course would meet twice per week and include a lecture and a lab. The lecture may be "flipped" (i.e., a hybrid course).

The session began with an overview of two Howard Hughes Medical Institute (HHMI) activities.

- In the first, students receive laminated "gene cards" which contain tumor suppressors and proto-oncogenes that they use to paste stickers on large paper models of the human genome posted around the room. **Learning Outcome**: Genes associated with cancer don't cluster on particular chromosomes but are found throughout the genome.

- In the second, students receive patient cards, each representing one of six different types of cancer, and each with a list of genes associated with that cancer. Students then work together in groups to discuss the various causes of each type of cancer. **Learning Outcome**: Many of the same genes are associated with multiple types of cancer.

Next the Board reviewed the Course Outline and took notes on the Feedback Form prior to a group discussion. Key points raised are discussed below. Note that some of the discussions overlapped more than one category or question (particularly 1 and 2).

1. **Are there topics on the Course Outline that you believe are especially important to include in this course? Alternatively, you could mark those topics with a star [*] on your Course Outline handout**.
    - The various causes of cancer, perhaps bring in the HPV vaccine
    - Lifestyle, environmental causes like pesticides, smoking, heritability/genetic overlap? Some cancer or cancer risk is heritable while some is not (noting that only a small percentage is hereditary)
    - Small vs. large molecules, cell-based immunotherapy
    - Signal transduction Mark mentioned (key in cell cycle)

2. **Are there topics that you believe are missing from the Course Outline?**

    - Reitha – personalized tumor treatments ("targeted therapy" Jan). Dina noted that some targeted therapies, especially those for breast cancer, are covered in Molecular Biology
    - Diagnostics and, in week 5 pre-emptive treatment; Jan is collaborating with ISB, who is part of the TCGA
    - Jan – Review standardized versus targeted therapies, and emphasize the high rate of resistance that necessitates combination therapy
    - Dina – How scientists talk about genetics versus how doctors and genetic counselors do; the former would call *BRCA1* mutations recessive, while the latter would call it dominant, as in 'inheriting the risk'
    - Reitha – within a single tumor there is more than one mutation
    - Targeted therapies – cost and reimbursement, patient group size
    - Tumor micro environment – week 4
    - Tie into cell culture….
    - Also week 4 – a lot of ideas on targeted therapies… combination… various modalities… unclear… Jan said some sort of list. Go to Sandy's database.
    - Dina – If students will be presenting on different targeted therapies in week 5 using primary research articles, it may be helpful to "narrow their universe" of papers (i.e., pre-screen for them).
    - Wet lab feedback? PCR screening and characterization of cell lines, TCGA, Western blots.
    - Sandy asked about antibody staining of cells. Jan developed an assay where students stain the nucleus, actin and the plasma membrane [the latter to model staining of Estrogen Receptor on breast cancer cells]. These can be imaged with our new EVOS from Fisher, instead of the Olympus immunofluorescence scope.

3. **Do you believe that this course should be required for all Biotechnology students, required for Immuno-Biotechnology students, or should remain an elective for both?**

5 Board members believe that this course should be required for Immuno-Biotechnology Students

5 Board members believe that this course should be required for both general Biotechnology and Immuno-Biotechnology Students

Mark noted that it could be recommended but not a required course

4. **Currently, the Biotechnology team is proposing that BIOL 270: Molecular Biology lecture be a prerequisite for this course. BIOL 270 covers the Central Dogma, Cell Cycle, and Signal Transduction in detail. Does this seem like a reasonable requirement?**

Dina noted that all students must have taken Cellular Biology before starting the Biotechnology Program, and Molecular Biology is required for about 75% of other Biotech classes

7 Board members believe that Molecular Biology should be a prerequisite for Cancer Biology [Mark noted the importance of signal transduction, cell cycle, etc.]

3 Board members believe that Molecular Biology should be recommended but not required as a prerequisite for Cancer Biology

5. **Do you believe that BIOL 277: Immunology Lecture & Lab should be a prerequisite for this course?**

5 Board members believe that Immunology should be a prerequisite for Cancer Biology

3 Board members believe that Immunology should be strongly recommended but not required as a prerequisite for Cancer Biology

6. Action Items & Other New Business

- Shoreline has partnered with the Edmonds School District, AGC Biologics, and Meg O'Conor on a PAYA grant (Partnership to Advance Youth Apprenticeships) as part of Washington's Career Connected Learning program.
- Sandy requested interviews with Life Sciences Washington
- Additional information about internships was requested:
    - They can be completed in any quarter, once the student has completed 10 credits of Biotech coursework. 50-60% are during summer quarter, about 35% in fall, and a few in the in winter of their second year.
    - They are usually 20 hours a week, while some are 30 or 40.
    - Some formal internship programs like those at SeaGen ISB have online postings that open and close very quickly
    - Currently in Biotechnology Seminar winter quarter, students researching companies, prepare their resumes and cover letters, practice networking, hear from Board members and alumni during panel discussions, etc, to help prepare them for the application process.

- A student, Kara Anderson, has requested an informational interview via phone. Arthur volunteered to help.
- Reminder: Please complete the NSF-sponsored Board survey. Dina will send a reminder. It should only take 10-15 minutes.

Adjourned at 11:35a. Next meeting will be in June, the same day as the Biotechnology Student Poster Symposium. A "Save the Date" will be sent in April.

Submitted by

Dina Kovarik, MS, PhD
Program Chair, Biotechnology Lab Specialist Program

Attachments: Meeting Handouts

Biotechnology Lab Specialist Program
March, 2019 Student Update

Completing/Completed: 2016-2017 Cohort

Student	Internship	Employment
Preethi Jayaraman	Completed	Seeking employment
PL	Paused	Completed Classes
Cole Ditzler	Seeking	

Completing/Completed: 2017-2018 Cohort

Student	Internship	Employment
Elizabeth Glenn	Completed	Seeking employment

Current 2018-2019 Cohort

- AAAS Students = 4
- Certificate of Completion Students = 11
- Other = 4

Future 2019-2020 Cohort

- AAAS Students = 4 (taking classes at Shoreline)
- Certificate of Completion Students = 8

Future 2020-2021 Cohort

- AAAS / AAS-T Students = 2 (taking classes at Shoreline)

Cancer Biology Course Outline

Overview: This is a new course developed with funds from the NSF grant, START Immuno-Biotech. It is proposed as a five-week lecture and lab course which would be an elective for Biotechnology students and would also be open to other non-Biotechnology students, including post-baccalaureate student, Allied Health students [Nursing, pre-med], and incumbent workers.

Week	Lecture topics	Activities	Labs
1	**The Nature of Cancer** • Central dogma & cell cycle review • Tumorigenesis – tumors arise from normal cells, benign vs malignant • Causes of Cancer – hereditary, viral, chemical, life style, genetic • What do these have in common? Changes in DNA • Oncogenes/Tumor Suppressor Genes	Howard Hughes Medical Institute (HHMI) Oncogene/Tumor Suppressor Gene activities: • Chromosomal locations of these genes • Involvement of some genes in multiple tumor types • Tumors often have mutations in multiple oncogenes or tumor suppressor genes • Tumors found in the same tissues may have different causes	• *Brca1* bioinformatics: BLAST alignment, visualize wile type and M1775R mutant in Cn3D • Intro to The Cancer Genome Atlas (TCGA) database mining • Transformation of NIH 3T3 cells o *c-src* vs *v-src* o *c-ras* vs *v-ras*
2	**Oncogenes** • Discovery of the first oncogene (*v-ras*) – understanding that viruses can cause cancer • Discovery of other oncogenes • Mechanisms of proto-oncogene activation Examples: o *Ras* (mutation) o *Her2* (gene amplification) o *Bcr-abl* (translocation) • How do oncoproteins perturb cell behavior? • Review Signal Transduction	Continue HHMI activities	• Continued TCGA mining • Check cell transformations • Southern blot – Her2 amplification

3	**Cell Cycle and Tumor Suppressor genes** • Retinoblastoma gene • Other tumor suppressor genes • Loss of Heterozygosity • Functions of tumor suppressor gene-encoded proteins		• Check cell transformations • Western blot – Detection of phosphorylated versus non-phosphorylated tumor suppressor protein
4	**Tumorigenesis/Metastasis** • Tumor Progression • Invasion • Metastasis	Students choose a targeted therapy not covered in class. Research the chosen therapy.	• More TCGA mining – looking at individual patient data to determine treatment options • Check cell transformations • ELISA – detection of biomarker of metastasis
5	**Targeted Therapies** • Small Molecule (Gleevec) • Antibody (anti-EGFR, anti-PD-1R, anti-HER2) • Immunotherapy (CAR T cells)	Students give a brief oral report on their chosen targeted therapy to the class.	• Fluorescent cell staining – detection of over-expression of a membrane-expressed growth factor • Check cell transformations

Cancer Biology Course Outline
Board Feedback Form

Name and/or Company (Optional): _____

6. Are there topics on the Course Outline that you believe are especially important to include in this course? Alternatively, you could mark those topics with a star [*] on your Course Outline handout.

7. Are there topics that you believe are missing from the Course Outline?

8. Do you believe that this course should be required for all Biotechnology students, required for Immuno-Biotechnology students, or should remain an elective for both?

9. Currently, the Biotechnology team is proposing that BIOL 270: Molecular Biology lecture be a prerequisite for this course. BIOL 270 covers the Central Dogma, Cell Cycle, and Signal Transduction in detail. Does this seem like a reasonable requirement?

10. Do you believe that BIOL 277: Immunology Lecture & Lab should be a prerequisite for this course?

Please feel free to add any additional comments on the back page and/or on your Course Outline handout.