I will teach Biology 100 during Fall Semester 2015. This will be my first time to teach the course. It is a general education course and introduces fundamental biological principals. Below is an abbreviated form of the learning outcomes for this course (others in my department developed these previously):

- Acquire basic literacy and technical skills in the language of science in general and biology in particular.
- Exercise sound scientific reasoning.
- Accept responsibility for personal and public stewardship.
- Develop intellectual character.

To teach this course, I am going to use a balance of lectures and active learning exercises. Others in the department are helping me with active-learning exercises that they have used previously. However, I would like to use the funding from this proposal to buy additional materials that I can use to teach content and perform learning exercises with my students. For example, I may want to purchase one or more of the following kits to help my students understand how water molecules bond to each other: [http://www.amazon.com/gp/product/B005QOO6DC/ref=ox_sc_act_title_2?ie=UTF8&psc=1&s=mid=A2ZZNV62MA3J50](http://www.amazon.com/gp/product/B005QOO6DC/ref=ox_sc_act_title_2?ie=UTF8&psc=1&s=mid=A2ZZNV62MA3J50) Teaching these concepts abstractly will not be as helpful as using such props.

In addition, I need to brush up on my biochemistry knowledge and knowledge about general biological concepts. Thus, depending on whether I have money left over, I may choose to buy books that will help me to gain greater depth in these areas. Finally, I may choose to buy a book on active learning. This resource would help me to find additional ideas for engaging students during class time and hopefully to help them learn the concepts they need to learn.
Self-assessment of my strengths, skills, competencies, interests, opportunities, and areas in which I wish to develop

Strengths:
- Getting things done through consistent effort
- Organizing myself
- Communicating difficult concepts to non-specialists
- Writing clearly
- Having a broad perspective
- Not afraid to delve into details of a research problem
- Working hard
- Collaborating (and getting along) with colleagues from different fields and institutions
- Having a strong love of teaching and a passion for working with students
- Easy for others to get along with me
- Committed to BYU’s mission and aims
- Happy to be at BYU where value is placed on mentoring students
- Motivating students to work hard because they know I will support them well.

Skills:
- Analyzing many different types of data (DNA-Sequencing, RNA-Sequencing, gene-expression microarray, proteomic, clinical)
- Appropriately applying statistical and machine-learning techniques to biological data
- Developing methodologies and software tools for analyzing biological data
- Installing and configuring others’ software (so I don’t have reinvent the wheel)
- Ability to write with effective grammar and with narratives that flow well
- Ability to teach on a broad range of bioinformatics topics

Competencies:
- Understanding many aspects of cancer biology so that I can connect my informatics expertise with the challenges faced by those who seek to understand how tumors develop and how to treat them.
- Familiarity with cutting-edge methods for analyzing biological data so that I can teach students these concepts and apply them in my research.
- Commitment to meeting with undergraduate students frequently so they will have rich research experiences.
- Engaged with the research community and thus understand top research priorities.
- Experience and knowledge to bridge multiple research fields and communicate with specialists in these fields.
Interests:

- Producing research that makes the world a better place by helping us understand more about disease (especially cancers) and how to treat disease.
- Via collaborations, accomplishing more than I could in my own silo.
- At the same time, pursuing my own ideas that are feasible to accomplish at BYU.
- Making it easier for (non-computational) biologists to analyze large and complex biological data sets through education and through developing methods for organizing, standardizing, and analyzing such data.
- Improving the methodology and rigor with which machine-learning methods are applied to biomedical data.
- Openness
  - Making my research reproducible and my methods accessible to the research community
  - Open education - sharing ideas and course materials with others in the community

Opportunities:

- Lots of publicly available data.
- Lots of open-source tools available for processing omic data and performing data analyses.
- Dropping prices for generating omic data.
- Facilities at BYU for generating omic data.
- Colleagues are interested in collaborating with me because few others have the same skills within the state of Utah.
- The number of students in the Bioinformatics major is growing; thus many students are available to work on research.
- Lots of open questions in my field that I can address.

Development areas:

- Strengthen my understanding of fundamental biological concepts and their implications for the world we live in (so I can be an effective BIO 100 teacher).
- Figure out how to strategically position myself so that I can get grant funding as a principal investigator (not only in collaborative settings).
- Learning to be more confrontational, when needed, with students and colleagues.
- Learning how to interact more effectively with students so that I motivate them to work hard on their projects, do quality work, and stay with the lab long enough that their productivity increases.
- Continue to improve BIO 465 so that students gain more experience with “real-world” problems and so that my grading evaluations are more standardized and rigorous.

Citizenship goals
Establish collaborations with faculty inside and outside of BYU.
  o Continue or extend collaborations with Andrea Bild (U. of Utah), Evan Johnson (Boston U.), Deb Neklason (U. of Utah), Brian Shirts (U. of Washington), Claudio Villanueva (U. of Utah), Matt Williams (U. of Utah), Marc Hansen (BYU).
  o Become adjunct faculty at University of Utah so I can more easily collaborate with colleagues there.
  o Reach outside myself at conferences to get to know people who may be potential collaborators or who at least can give me advice.

Serve on department’s Curriculum Committee.
  o Take part in discussions
  o Provide feedback on initiatives the committee is pursuing

Reach out to colleagues in my department and college so I can see how my research relates to their research and share teaching ideas with them.
  o Leave my office door open for part of the day so others feel open to stop in
  o Schedule lunch once a month with a colleague
  o Interact as often as possible with other Bioinformatics faculty at BYU so I can learn from their experiences and help them where possible.

Attend department and college seminars as often as I can, even if the topic doesn’t directly align with my research interests.

Peer review one article per month (if requested).

Teaching goals

  • Talk to faculty who have taught BIO 100 and ask advice on effective ways of teaching that class. Also ask for examples of their syllabi and assessments so I will not need to reinvent the wheel.
  • Have lecture materials, assignments, and tests fully prepared at least one week before they are needed (not last minute).
  • Improve BIO 465 in my second year so that the semester flows better and I have more effective ways of assessing student performance (more objective forms of assessment).
  • Help organize the inaugural Cancer Systems Biology conference in 2016.
  • Be approachable enough that students will feel comfortable stopping by my office for help during office hours (or via email).
  • Be highly organized as a teacher (using Learning Suite as a tool).

Scholarship goals

  • Establish a cohesive theme for my own research.
  • Develop my ability to mentor undergraduate students through research projects.
    o Submit at least one publication per year with an undergraduate as the first author.
Have at least two students give presentations each year at a peer-reviewed conference.
Provide an environment in which students will want to stay in my lab until graduation.
  • Publish an average of 5 papers per year.
    o Be corresponding author or first author on at least 2 of those papers.
  • Present my research at 2 conferences per year.
  • Obtain at least three types of external grant funding by the time I apply for CFS.
    o Apply for at least funding opportunities per year.

Resources needed to accomplish these goals

  • Undergraduate salary support (provided so far via my startup package)
  • Travel money (startup so far)
  • Capital equipment (servers, storage space, DNA sequencing = startup)
  • BIO 100 course manager (Stephanie Burdett)
  • Center for Teaching and Learning (have been meeting with consultant)
  • Publication charges covered

So far I have been very pleased with the resources available to me. The biggest bottleneck is time. I have more to learn about managing my time. However, on a positive note, I feel that I am learning a lot and doing a good job at mentoring students (including collaborators’ students) so that they can work independently and thus accomplish more.

My activities and accomplishments so far in achieving these goals

  • Teaching: Received good ratings for BIO 465 in Winter Semester.
  • Teaching: Have discussed BIO 100 with various faculty and feel confident in my syllabus.
  • Citizenship: Currently serving on Curriculum Committee.
  • Citizenship: Participating in many different collaborations with colleagues.
  • Scholarship: I have established collaborations with 7-8 colleagues at BYU and beyond. If anything, I will need to keep this in check so I don’t do too much. But these collaborations are so far showing a lot of promise.
  • Scholarship: I have already been an author on 4 papers in 2015. I am optimistic that I will get more by the end of the year.
  • Scholarship: I have had one undergraduate present a poster at a national conference so far.
  • Scholarship: I have presented at two conferences so far.
  • Scholarship: I have been a co-investigator on an R01 (NIH) grant submission.
  • Scholarship: I have worked with (and learned a lot in the process) 10 undergraduate students so far.
  • Scholarship: I am participating in writing review sessions with colleagues in the college.
Scholarship Strategies Project, 2015  
Stephen Piccolo  
Department of Biology

General research theme: “Develop novel ways to derive biologically and clinically relevant insights from ‘omic’ data.”

Specific research themes:

1. Understand how tumors evolve at the molecular level and develop methodologies for predicting which drugs are most effective for a given tumor (“n of 1” clinical trials).
2. Identify disease-causing genetic variants through intelligent ways of filtering such data.
3. Aggregate ‘omic’ data from public repositories, standardize data across these sources, and provide tools and tutorials that make it easier for non-computational scientists to use the data.
4. Using publicly available data, evaluate which algorithmic approaches are most useful for deriving biologically and clinically relevant insights and develop tools that enable other scientists to automatically determine which algorithms would be best for their own data sets.

Research methods:

- Machine learning (classification, clustering, feature selection)
- Statistical approaches for data standardization and normalization
- Web application development (as a way to enable others to access summarized data)
- Pathway-based analysis methods: account for interactions and redundancies among genes to gain better insights into the biological systems that influence disease development.
- Filtering genetic data by assessing 1) a variant’s impact on protein sequence, 2) level of evolutionary conservation, 3) frequency in control populations. In addition, I am collaborating with clinical geneticists who have access to large databases that delineate known clinically relevant variants.

Types of papers/projects (and top target journals):

- Methods development and benchmarking
  - Bioinformatics
  - BMC Bioinformatics
  - PLOS Computational Biology
  - Nature Methods
  - Genome Research
  - Source Code for Biology and Medicine
- Data compilation
- Scientific Data
- Database
- Bioinformatics
- Gigascience
- **Biological findings**
  - PLOS Biology
  - eLife
  - Genome Biology
  - Frontiers in Genetics
- **Clinical findings**
  - Genome Medicine
  - Molecular Oncology
  - Molecular Cancer Therapeutics

**Scholarship practices / goals between now and February 2016:**

- Allocate 2 hours at the beginning and 1 hour at the end of each workday to papers and grants (using the Pomodoro Technique).
- Track my time spent each day on papers and grants.
- Ask for feedback from program officers on my specific aims before writing the remainder of each grant application.
- Read a book on scholarly writing and implement those ideas in my writing.
- Submit to two external funding opportunities.
- Submit a MEG.
- Submit an abstract to the Genome Informatics conference and Cancer Systems Biology conference. Present in at least one of these conferences.
- Publish at least three additional papers between now and February 2016. Be corresponding author and/or first author on at least 2 of those papers.
- Spend at least 20 minutes per day reading scientific journal articles in my field (while riding the bus to work).

**Ways of evaluating my success:**

- The # of hours and consistency with which I perform my research.
- The # of papers that I publish and the quality of the journals in which I publish.
- Whether I get external funding (I will hear back by then on at least one funding opportunity).
The purpose of this project is for me to reach out more to colleagues.

I am introverted by nature, so it can be a stretch for me to reach out to colleagues when I attend conferences and other events. I am planning to attend 2 conferences before February 2016. I am also on the organizing committee for a new conference, which will take place in April 2016. The organizing committee consists of other early-career researchers, so it is an especially valuable opportunity for me to get outside my comfort zone. To make the most of this opportunity, I will speak up on conference calls (when it would be helpful), and I will participate in the process of reviewing abstract submissions for the conference. When I attend the conference, I will make an effort to reach out to my colleagues at meals and in discussions about research.

I also plan to attend conferences in July and October. I will get out of my comfort zone by inviting others to go running with me. I will use Twitter as a way to initiate this. Or if someone else initiates it, I will join them.

My research is quite different from many others in my department and college. Accordingly, I feel it is important for me to reach out to faculty who specialize in different types of research. I have asked some colleagues to lunch, and that has been a good thing. I plan to continue that, with a goal to have lunch at least once per month with a colleague either from my own department or from the college.