THE INFORMATION/DATA NEEDS AND CHALLENGES OF BIOMEDICAL RESEARCHERS IN THE AGE OF OMICS

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Background

High-throughput technologies are rapidly generating large amounts of diverse omics data. Although this offers a great opportunity, it also poses great challenges as data analysis becomes more complex.[1,2] The purpose of this study was to identify the main challenges researchers face in analyzing data, and how academic libraries can support them in this endeavor.

Methods

A multimodal needs assessment analysis, combined an online survey of 860 Yale-affiliated researchers and 15 in-depth one-on-one semi-structured interviews. Interviews were recorded, transcribed, and analyzed using NVivo 108 software according to the thematic analysis approach.

Results

The common training needs identified were for R, Python, Perl, Unix Linux, in addition to Galaxy, MatLab, SPSS, and statistics for biologists.

INTERVIEWS:

Two main themes emerged from the interviews: personnel and training. Researchers feel they could improve data analysis practices if they had better access to the appropriate expertise for data analysis, and/or training in data analyses tools and resources.

PERSONNEL:

Among the 15 interviewees, 13 commented on challenges related to personnel. Experts in data analysis are in high demand and many labs, particularly smaller ones, have difficulty acquiring access to staff with those skill sets. As a result, researchers feel that valuable time is wasted either waiting to work with an expert or attempting to do the analysis with their own staff.

“How hard it is to get someone to sit down and analyze the data for you. Those who are able to do it are in high demand.”

Even when researchers have access to a bioinformatics or bioinformatician, poor communication between these professionals threatens the quality of their collaboration.

“[There is] a little disconnect between how he did the analysis and how we understand what he did. Part of it is that they don’t do any biology, and we only do biology, so there is that difference there”

TRAINING:

Among the 15 interviewees, 10 commented on problems related to the lack of training that would allow them to conduct their own data analysis. In order to efficiently use the preponderance of new tools and resources, a certain level of expertise in data analysis is required. Unfortunately, researchers recognize that they do not always have a strong enough background in this type of work.

“You need to know how to talk to a bioinformatician. You need to have someone know what code looks like, what optimization means and help researchers understand what the limitations are and what to ask bioinformaticians or statisticians. Training that would allow researchers to understand what statisticians can do, to allow them to communicate better with them, would be helpful.”

These researchers want to be able to do their own analysis and not rely on other staff. Training needs vary and range from learning how to use specific commercial tools such as IPA, to how to use a cluster, code with R, or a desire for more general training in statistics. These needs reflect those identified from the survey as well.

TIME:

In both cases, interviewees noted time as an underlying barrier. Researchers consistently commented on the time it takes for them or others to analyze data, difficulty in finding time to acquire expertise in using data analyses tools, and a lack of time to investigate and evaluate the resources available to help them analyze their data.

Conclusions

Although library-centric bioinformatics support programs cannot solve all of the challenges identified, it can be instrumental in helping ameliorate some of them.

Access and Awareness

• Licensing user-friendly proprietary bioinformatics tools. Most proprietary software require no programming skills, and companies provide technical support.
• Inviting and hosting vendors to demonstrate different commercial software products. These types of sessions can promote awareness of applicable tools and how to use them which researchers can choose to purchase if the library cannot.[3]

Partnerships

• Creating partnerships with other campus units allows libraries to broaden and package data analysis services, including training opportunities.

Peer-Teaching

• Individuals who are not official teachers in a particular field, but help those from a similar social group learn a particular skill set or specific concepts.[4]
• Peer-teachers share similar experiences, challenges, and a set of knowledge as those they are educating, which allows them to effectively communicate the information they are teaching to students who are their peers.
• Better able to tailor the instruction material to the attendees’ current needs which has resulted in better learning outcomes.

Strategic Planning

• Academic libraries can make it a strategic priority to build up their own bioinformatics programs. [5,6]
• Library administration would need to devote more funding for commercial bioinformatics software to assist with routine analysis, and to hire librarians with backgrounds in bioinformatics who can identify and manage these resources and develop workshops and training sessions tailored to their researchers’ needs.

References


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