Incubators: A community based model for improving the usability of bioinformatics learning resources

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NIBLSE, QUBES, & CourseSource

The Network for Integrating Bioinformatics into Life Sciences Education (NIBLSE) is an NSF funded Research Coordination Network that aims to establish bioinformatics as an essential component of undergraduate life sciences education. As part of that effort, the project is working to make existing bioinformatics learning resources more accessible to non-specialists and increase their use across undergraduate biology courses. To this end, NIBLSE has partnered with the Quantitative Undergraduate Biology Education and Synthesis (QUBES) project and CourseSource to develop and implement a novel model for supporting the refinement, publication, and dissemination of high quality bioinformatics teaching resources.

Example NIBLSE Core Competencies
Explain the role of computation and data mining in addressing hypothesis-driven and hypothesis-generating questions within the life sciences.
Summarize key computational concepts, such as algorithms and relational databases, and their applications in the life sciences.
Apply statistical concepts used in bioinformatics.
Use bioinformatics tools to examine complex biological problems in evolution, information flow, and other important areas of biology.

Figure 1. A subset of the NIBLSE Core Competencies. The competencies are skills that NIBLSE recommends all life science students be able to do by the time they graduate.

Incubator Structure and Goals

NIBLSE Incubators are small (5-7 people), short-lived (4-8 weeks), online communities that work with an existing learning resource to:

1) improve its usability across diverse life sciences classrooms;
2) foreground and teach important bioinformatics learning outcomes;
3) move the learning resource toward publication and broader dissemination.

An Incubator community includes the resource author, a NIBLSE editor, a QUBES collaboration facilitator, and a set of participants who are recruited to contribute pedagogical, bioinformatics, and biological expertise. The group uses the QUBESHub infrastructure to communicate and coordinate their work revising the learning resource. The incubator products are then made available to the bioinformatics community as an open education resource. This will facilitate future revisions and customization with the ultimate goal of publication in an open-access journal such as CourseSource.

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Incubator Workflow

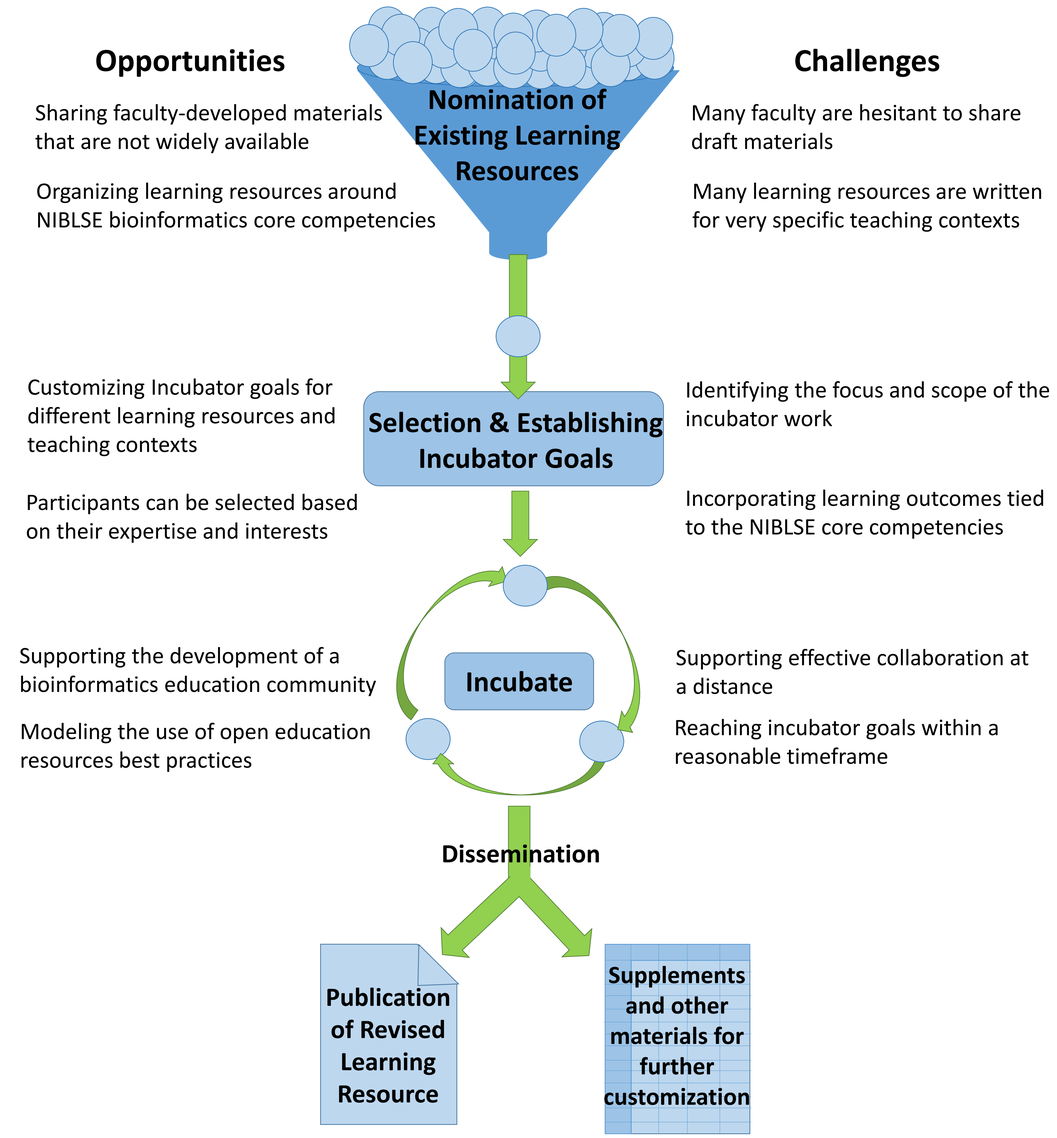

Figure 2. Outline of the NIBLSE Incubator Workflow.

NIBLSE — Bioinformatics in Life Sciences Education

- NIBLSE is a community working to establish bioinformatics as an essential component of life sciences education.
- Community members submit materials, participate in Incubators, and the NIBLSE core competencies guide development.
- qubeshub.org/groups/niblse

QUBES — The Power of Biology × Math × Community

- The QUBES project works to incorporate quantitative approaches into undergraduate biology education.
- The QUBESHub infrastructure facilitates online collaboration, and publication.
- qubeshub.org

CourseSource

- CourseSource is an open-access journal of peer-reviewed teaching resources for undergraduate biological sciences.
- CourseSource works with NIBLSE to define a bioinformatics learning framework and hosts published learning resources aligned with that framework.
- coursesource.org

Figure 3. NIBLSE Incubator partners and contributions

Recruiting diverse learning resources

Many faculty have developed materials for use in their own courses but these are generally not easy for other faculty to find or use - particularly when they include bioinformatics content and techniques. Furthermore, faculty who have developed materials may be hesitant to share them "as is". A survey of faculty teaching bioinformatics established that there are sufficient developed materials, and that faculty would be interested in sharing within a community established for this purpose. We believe that the Incubator model provides a mechanism that encourages faculty to share unpublished learning resources in a manner that will facilitate the teaching of bioinformatics by non-experts.

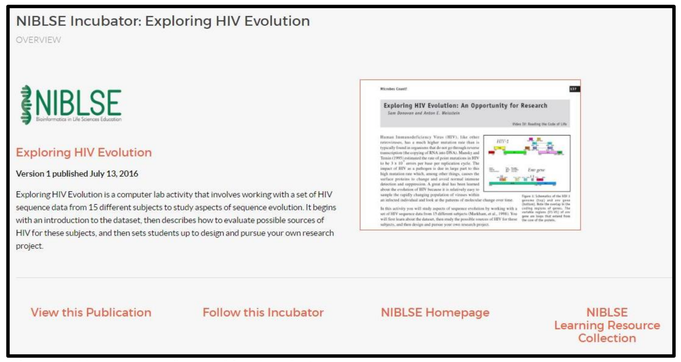

Figure 4. Homepage of a working Incubator group.

Organizing small collaborative communities

Anticipating the specific needs of diverse teaching and learning contexts is impractical. However, we believe that by focusing on the refinement of materials to support particular bioinformatics learning outcomes, and providing teaching notes to make technical topics more accessible, that incubators can broaden access to bioinformatics topics across the undergraduate curriculum. Each incubator establishes a set of goals and tasks that are specific to the development of a particular learning resource. Participants are recruited and take on small tasks that contribute to the development of the revised materials. Incubator groups work synchronously and asynchronously in an online space hosted by QUBESHub. The products of incubators are made available under a creative commons license and the authors are encouraged to pursue publication in outlets like CourseSource.

How you can get involved

bit.ly/NIBLSE_get_involved

Submit a learning resource - Share something you have developed with the community and it will be considered for possible incubation.
Follow an active incubator - Track learning resources you are interested in and receive updates about incubator publications and products.
Volunteer as an Incubator participant - Join the NIBLSE Group on QUBES and participate in an incubator (not everyone needs to be a bioinformatics specialist).
Use the incubator products - Visit the NIBLSE Learning Resource Collection to view and download the available incubator materials.