Supporting Trainers to Improve Bioinformatics Education Globally

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Why GOBLET?

• Researcher perspective to training
• Trainer perspective to training
• GOBLET: mission, priorities & achievements
• Future Goals of GOBLET
• Tips & Tricks to Bioinformatics Training
Research Today

So much data is available to researchers today, that one is rapidly overloaded.
Black Box of Bioinformatics

ATCGGCGGTCGANNAGGA

Passing off one’s raw data to a bioinformatician (or commercial software package) can be a black box experience
A recent GOBLET survey of scientists asked:

“Which bioinformatics skills training would you most value?”

• 50% responded “Help me analyze & interpret my data”
  o Which tool?
  o Which analysis pipeline?

• Where can I gain some bioinformatics training?
Bioinformatics Training Today

Ever larger data sets
+
Requirement for reproducible research

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Growing need & demand for bioinformatics training
Flip Side: Training Challenges

• Difficult for a trainer to have expertise in all areas of bioinformatics
• Time consuming and costly to create teaching materials from scratch
• How do you get training into geographically remote locations or resource poor areas?
• Outside of an academic setting, how does a trainer get credit for providing training?
• Given these challenges but the obvious need, how can bioinformatics training be made sustainable?
GOBLET
Global Organisation for Bioinformatics Learning, Education & Training

GOBLET was initiated to:
• Share, not duplicate efforts
• Share, not duplicate costs
• Work together towards common solutions & a sustainable future

GOBLET became a legal registered foundation in Nov’12
GOBLET’s Mission

• To provide a global, sustainable support & networking infrastructure for bioinformatics trainers and trainees
• To facilitate capacity development in bioinformatics in all countries
• To develop standards & guidelines for bioinformatics education & training
• To act as a hub for fund gathering in support of training
• To reach out to teachers at high schools, to bridge the gap to the next generation of bioinformaticians
• To foster the international community of bioinformatics, biocuration, bio-computing and computational biology
Who is GOBLET?

- 30+ international societies & networks, national institutes & organizations, research & interest groups, SMEs
- Also individual members
- GOBLET welcomes new members who provide bioinformatics training or for whom bioinformatics training is needed
GOBLET Priorities

1. Quality – of training, training resources & trainers
2. Accreditation – of materials & courses
3. Incentive – recognition of trainers
4. Training Methods – best practices across various teaching modalities (lectures, e-learning, etc.)
5. Outreach – to life science researchers, high schools & public
6. Sustainability – of funding & membership

Committees have been created around these priorities, and are actively engaged in realizing these priorities.
Learning, Education & Training Committee

Chair
Nicola Mulder
University of Cape Town

Co-Chair
Celia van Gelder
Netherlands Bioinformatics Centre

• Develop & share best practices
  o In teaching & learning methods
  o In quality curriculum

• Provide recognition, support structures & resources for trainers
  o Materials: Lectures, Exercises, Data sets
  o Methods
  o Train-the-trainer programs

• Provide outreach training to life science researchers, high schools & public
Standards Committee

Chair
Pascale Gaudet
Swiss Institute of Bioinformatics

- Provide accreditation mechanism for trainers, learners & materials
- Increase quality of training materials & programs through standards
Technical Committee

Chair
Manuel Corpas
The Genome Analysis Centre, UK

• Provide a support structure for trainers & trainees
• Maintain an open training portal for quality, accredited training materials, courses, trainers, and bioinformatics training opportunities
Fund-raisin Committee

Chair
Patricia Palagi
Swiss Institute of Bioinformatics

- Raise funds to sustain GOBLET
- Financially support collaborative training projects within GOBLET & the training community
Outreach & PR Committee

Chair
Erik Bongcam-Rudloff
Swedish University – Global Bioinformatics Centre

• Promote GOBLET’s mission, training resources, activities & events
• Maintain social network & galvanize the community to participate in GOBLET initiatives
# GOBLET Activities

## Training portal

This portal allows you to browse our course pages and training materials, and to download content of interest. For GOBLET members, the portal also allows uploading of course pages and training materials. If you would like to know how to upload your training materials and courses, please join us!

### List of training materials and course pages

Displaying 1 - 30 of 73

<table>
<thead>
<tr>
<th>Updated date</th>
<th>Type</th>
<th>Topic</th>
<th>Audience</th>
</tr>
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<tbody>
<tr>
<td>GOBLET Poster at ISMB 2014 Updated 1 day 6 hours ago</td>
<td>Training material</td>
<td>GOBLET survey of life scientists</td>
<td>Educators, Trainers, Ontologists</td>
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<td>&quot;Key terms&quot;, a learning game for conceptual consolidation Updated 3 days 9 hours ago</td>
<td>Training material</td>
<td>Instruction, training, Education</td>
<td>Educators, Trainers, Ontologists</td>
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<td>Training material</td>
<td>Functional Association Networks, Gene Function Prediction, GeneMANIA</td>
<td>Graduate Students, Post-Doctoral Fellows, Researchers, Biologists, Genomicists, Computer Scientists</td>
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<tr>
<td>Pathway and Network Analysis of-omics Data (2014) Updated 1 week 1 hour ago</td>
<td>Course page</td>
<td>Pathway and network analysis</td>
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</tr>
</tbody>
</table>
GOBLET Activities

GOBLET Global Organisation for Bioinformatics Learning, Education & Training

Empowering people, harnessing communities, networking networks

GOBLET was established in 2012 by a group of international & national societies & networks to offer an umbrella for bioinformatics, biocuration, biocomputing & computational biology (B3CB) learning, education & training.

Our Mission

- To provide a global, sustainable support & networking infrastructure for bioinformatics trainers & trainees (including a training portal for sharing materials, tools, best practice documents, etc.)
- To facilitate capacity development in bioinformatics in all countries
- To develop standards & guidelines for bioinformatics education & training
- To act as a hub for fund gathering
- To reach out to teachers at high schools to bridge the gap to the next generation of bioinformaticians
- To foster the international community

Our Ethos Embraces

- Inclusivity (welcoming all relevant organisations, networks, societies)
- Sharing (expertise, best practice, materials, tools, compute resources)
- Openness (using Creative Commons Licence)
- Innovation (welcoming imaginative ideas & approaches)
- Tolerance (transcending national, political, cultural & social boundaries)

Our Themes Include

- Quality (of training, training resources & trainers)
- Accreditation
- Incentivisation (recognition)
- Training methods
- Outreach
- Sustainability (funding)

Contact details & Executive Board & Term

GOBLET is chaired by Terri A; wood & Vicky Schneider, Vice Chair & Michelle Brazas, Secretary & Fran Lewis, Treasurer & Postal Address & GOBLET & Schuyting & CMBI & Radboud University & Nijmegen Medical Centre & Geert Grooteplein & 26P28 & 6581GB & Nijmegen & Email info@mygoblet.org & Website www.mygoblet.org

Participating organisations

- EMBnet
- ISCB
- APBioNet
- ASBCB
- ISB
- EBI
- NBIC
- bioinformatics.ca
- SIB
- IGC
- SEB
- ABN
- TGAC
- i5co
- CPGR
- TSL
- SGBC
- CSC
- EdGe
- Nowgen
- CGAT
- BioSharing
- WT Advanced Courses & Conferences

Types of membership

- Inaugural meeting, hosted by EMBnet, Uppsala, June 2012
- Corporate
- Student
- Individual
- International networks
- International societies
- National
- Associate (UKRLTD)
- Institutional (res/acad)

GOBLET aspects

- Fact Sheets
- Newsletters
- @mygobletorg
- LinkedIn Group
GOBLET Activities

- Meetings
- Train the Trainer workshops
- Outreach activities at conferences
- Annual General Meetings
GOBLET Activities

GOBLET Survey

Bioinformatics Training

• Worldwide distribution to known bioinformatics & life science mailing lists
• **498 respondents**
• Responses from: 22% Academic/PI; 24% Postdoc/research staff; 26% MSc/PhD students; 5% Technical staff; 23% Other
Ten Simple Rules for Developing a Short Bioinformatics Training Course

Allegra Via¹, Javier De Las Rivas², Leunissen³, Anna Tramontano⁴

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Introduction

This paper considers what makes a short course in bioinformatics successful. In today's research environment, exposure to bioinformatics training is something that anyone embarking on life sciences research is likely to need at some point. Furthermore, as research technologies evolve, this need will continue to grow. In fact, as a consequence of the introduction of high-throughput technologies, there has already been an increase in demand for training relating to the use of computational resources and tools designed for high-throughput data analysis, retrieval, and analysis. Biologists and computational scientists alike are seeking postgraduate learning opportunities in various bioinformatics topics that meet the needs and time restrictions of their laboratories. "Short Intensive bioinformatics..."

Best practices in bioinformatics training for life scientists

Allegra Via, Thomas Blicher, Erik Bongaerts-Rudloff, Michelle D. Brazas, Cath Broekbank, Aidan Budd, Javier De Las Rivas, Jacqueline Dreger, Pedro L. Fernandez, Carlos van Gelder, Joachim Jacobs, Rafael C. Jimenez, Jane Loveland, Fedorica Moran, Nicola Mulha, Timmi Nygren, Kristian Riisager, Maria Victoria Schneider* and Teresa K. Atwood*

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Erik Bongaerts-Rudloff is an Associate Professor in the Swedish University of Agricultural Sciences and Uppsala University, Sweden. He leads the Swedish COST Action and AllBio Coordination Action and is one of the founding members of the Global Organization for Bioinformatics Learning, Education and Training (GOBLET).

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Guesses about Bioinformatics Training in Australia

- Australia like Canada is geographically very large
- Geography makes providing bioinformatics training across the country difficult and inefficient
- Lack of available trainers to provide training on diverse bioinformatics topics
- Scarcity of training materials and worked data sets
GOBLET Benefits

Open access to lectures, exercises, etc. from other bioinformatics trainers
• An Australian trainer could use this material for their own training program

Sharing of trainers
• GOBLET members have shared trainers to remote locations

Training Community
• Participation in the GOBLET training community has been my most rewarding experience as the lone coordinator of bioinformatics training across Canada
What Next from GOBLET?

• Accreditation & acknowledgement
  o For material development
  o For teaching on materials
  o For facilitating a training session

• Creation of standards in bioinformatics materials & teaching

• Offer “Train the Trainer” sessions at bioinformatics conferences

• Offer “Bioinformatics Training” outreach sessions at life science conferences

• Publish & maintain bioinformatics exercises with accompanying data sets and facilitator notes

• Harmonize an annual bioinformatics and computational biology education and training conference
An ideal bioinformatics training program will have all of the following components:

- Assessing Bioinformatics Training Needs
- **Designing Bioinformatics Training** *
- **Facilitate Learning** ++
- **Support Transfer of Learning** *
- Evaluating Training

* 2 areas in bioinformatics training programs that need more effort and emphasis
++ What I have learned in my training programs
1. The Case for Learning Objectives

- No learning objectives = If you don’t know where you are going, it is difficult to choose how to get there
- Clear learning objectives make testing easier and fair
- Clear learning objectives help the student organize their efforts toward accomplishing the learning

- A learning objective describes the intended result of instruction, not the process of instruction

Clear Objective = Audience + Behavior + Condition + Degree
Tips on Learning Objectives in Bioinformatics Training

Clear Objective = Audience + Behavior + Condition + Degree

- Audience: The student will be able to...
- Behavior: States what learner is expected to do
- Condition: Under which performance is to occur
  - Given xx; When provided with xx; With the aid of xx
- Degree: To which performance is expected
  - Accuracy; Quality
Worked Examples in Bioinformatics

Poorly Stated Objectives:
• “Have a thorough understanding of how to perform BLAST”
• “Demonstrate a working comprehension of how BLAST works”
• “Be able to understand the difference between BLASTp & BLASTn”

Clearly Stated Objectives:
• “Given a protein sequence in fasta format, the student will be able to use BLASTp to perform a sequence homology search”

If the objective is vague, we are in the awkward position of being unable to demonstrate teaching anything at all!

Observable verbs: http://www2.gsu.edu/~mstmbs/CrsTools/cogverbs.html
2. Facilitating in Bioinformatics

Learning starts and ends with good facilitation

- What is facilitation?
  - Facilitation is “assisting or helping one to learn” in this case bioinformatics

- Why care about facilitation?
  - It sets the tone of the learning environment
  - It sets the attitude of the learner to learning
  - It sets the expectations of the learner
Facilitating in Bioinformatics

Pre-Classroom Facilitating:

1. Welcome note with information on yourself
   - Builds your credibility as a trainer
   - Invites and welcomes learner

2. Detailed installation instructions (if required)
   - Involves learner in their learning
   - Sets expectations of what they will learn

3. Schedule (even if draft)
   - Sets expectations of learning structure

4. Accommodation & travel logistics (if needed)
   - Reduces anxiety around planning

5. Contact information for yourself
   - Indicates you are open to helping out
Facilitating in Bioinformatics

In-classroom Facilitating:

1. Be the perfect host
   - Greet everyone warmly
   - Don’t run around at the last minute
   - Transmit calmness

2. Provide pointers in advance
   - What windows to have open, where to login, bathroom location, etc.
   - Reduces anxiety especially in bioinformatics classrooms!

3. Start on time & keep to a schedule
   - Shows respect for your learner’s time
   - Altering the schedule should be a dialogue both ways
Facilitating in Bioinformatics

In-classroom Facilitating:

4. Seek input on shaping learning environment
   - Ground rules should be proposed and agreed upon by everyone, not just the instructor
   - Learner feels involved in their learning

5. Encourage classroom interaction
   - Everyone has experiences they want to share
   - Learning by teaching someone else is powerful

6. Allow time for networking and reflection
   - Provide long breaks where possible (not just 5min, but 30min!)
   - Allows learners to discuss bioinformatics content with peers
   - Networking happens over coffee breaks
Facilitating in Bioinformatics

In-classroom Facilitating:

7. Red Flags
   - Use a flagging system to denote problems
   - Helpful for the instructor to gauge speed

8. Provide options (i.e. autonomy in learning)
   - Paper handouts or online version of lecture
   - Copy & paste commands or answer key as separate document
   - Worked data set or bring your own data (if possible)

9. Online forum for questions, discussion, notes from class
   - Not everyone likes to raise their hand
   - Etherpad, Todaysmeet.com, etc.

10. Listen & adjust
    - Each class is different, so make adjustments to suit your audience
Facilitating in Bioinformatics

Post-classroom Facilitating:

1. Provide participant list & contact information
   - Students will forget to do this, but later realize they need it

2. Open access to content
   - Panic sets in when learners feel they need to copy over everything now

3. Detailed installation instructions
   - If the classroom provided workstations, provide installation instructions so students can replicate their learning environment in their research space

4. Where to go for more information and help
   - As the application of skills begins back in their research environment, more specific questions arise. Point them to where they can seek help.
3. Transfer of Learning

- Most bioinformatics training programs aim to provide participants with informatic analysis skills, so that they can return to their research environments and further their research.

- However, most bioinformatics training programs do not adequately support transfer of learning back to the research environment.

We fear becoming a helpdesk for bioinformatics support!
Ideas on Learning Transfer in Bioinformatics Training

In the Classroom:

1. Make learning relevant
   - Worked examples need to be applicable to participant situation.
   - Where possible, allow participant to bring their own data in XX format

2. Shorten lecture content in favor of practice exercises

3. Allow time for reflection on learning
   - Ask participants to reflect on what they are learning and how they will use their new knowledge and skills back in their research environment

4. Provide opportunities for participants to support/teach each other
   - Being able to teach someone else reinforces learning
Ideas on Learning Transfer in Bioinformatics Training

Beyond the Classroom:

1. Role of supervisor in ensuring transfer of learning
   - Could we survey the supervisor to gauge how bioinformatics training has improved research of participant?

2. Provide job aids on how to use a tool or the analysis steps for a particular workflow
   - Medical doctors have such checklists!

3. Redirect to bioinformatics forums for support & sense of community
   - Begin all bioinformatics training programs with logging into BioStars.org

4. Conduct follow-up survey on learner progress & training impact
Acknowledgements

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