Why core competencies?

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A journey through lifelong learning
Competency

Competency is ‘an observable ability of any professional, integrating multiple components such as knowledge, skills, values and attitudes’.

• Acquisition can be validated objectively.
• Shared ‘currency’ applicable to learning of all types and at all career stages

Competency profile

• Defines the competencies required to fulfil a particular role
• Typically defined by professional bodies / learned societies in collaboration with employers
The ISCB Curriculum Taskforce’s approach

Survey
- Core Facility Directors
- Career opportunities
- Existing Curricula

Consult
- What’s missing? What needs fixing?
- Can we use the profiles to develop new training and improve existing training?

Refine
- Regular updates based on the reiteration of this cycle
- Openly available ‘living document’

Compile

We are here!
<table>
<thead>
<tr>
<th>Competency</th>
<th>Bioinformatics user</th>
<th>Bioinformatics scientist</th>
<th>Bioinformatics engineer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Examples of professionals in this role</td>
<td>Biocurator, physician, lab technician, ethicist</td>
<td>Computational biologist; molecular life scientist</td>
<td>Software developer, software engineer</td>
</tr>
<tr>
<td>Apply knowledge of computing appropriate to the discipline (e.g., effectively utilize bioinformatics tools).</td>
<td>Awareness</td>
<td>Awareness to working knowledge</td>
<td>Awareness to specialist knowledge</td>
</tr>
<tr>
<td>Apply knowledge of biology appropriate to the discipline.</td>
<td>Working knowledge to specialist knowledge</td>
<td>Awareness to working knowledge</td>
<td>Awareness to working knowledge</td>
</tr>
<tr>
<td>Analyze a problem and identify and define the computing requirements appropriate to its solution (e.g., define algorithmic time and space complexities and hardware resources required to solve a problem).</td>
<td>Awareness</td>
<td>Awareness to working knowledge</td>
<td>Awareness to working knowledge</td>
</tr>
<tr>
<td>Use a computer-based system, process, component, or program to meet desired needs in scientific environments.</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
</tr>
<tr>
<td>Design and implement a computer-based system, process, component, or program to meet desired needs in scientific environments.</td>
<td>N/A</td>
<td>N/A</td>
<td>Working knowledge</td>
</tr>
<tr>
<td>Evaluate the ability of a computer-based system, process, component, or program to meet desired needs in scientific environments.</td>
<td>N/A</td>
<td>Working knowledge</td>
<td>Awareness</td>
</tr>
</tbody>
</table>
## Clinical bioinformatics competency framework (a work in progress...)

<table>
<thead>
<tr>
<th>Role</th>
<th>Clinical bioinformatician</th>
<th>Other bioinformatician</th>
<th>Specialist clinician with genetics/genomics expertise</th>
<th>Other specialist clinician</th>
<th>Other clinician</th>
<th>Clinical genetic Scientist</th>
<th>Other healthcare scientist</th>
<th>Specialist nurse/counsellor</th>
<th>Nurses and other allied health professionals</th>
<th>IT specialist</th>
<th>Data specialist</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. responses</td>
<td>11</td>
<td>6</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td><strong>Example</strong></td>
<td>NHS diagnostic bioinformatician [1]</td>
<td>Academic bioinformatician</td>
<td>Clinical geneticist or pathologist, haematologist, microbiologist with leadership responsibility in clinical lab</td>
<td>Cardiologist, neurologist, oncologist, paediatrician</td>
<td>General Practitioner</td>
<td>NHS diagnostic clinical scientist, microbiologist, statistical/analytical epidemiologist</td>
<td>Genetic technologist, Immunologist, epidemiologist</td>
<td>Genetic counsellor; Preimplantation genetic diagnosis nurse; clinical nurse specialist in surgery or oncology; Genetic Diabetes Nurse</td>
<td>Non-specialist nurse/physiotherapist</td>
<td>Systems administrator</td>
<td>Curator, data scientist</td>
</tr>
<tr>
<td><strong>Competency</strong></td>
<td>Write computer programmes and algorithms that can analyse data</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>Awareness</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>Specialist knowledge</td>
</tr>
<tr>
<td></td>
<td>Analyse genomics data using pre-existing software, including linking genotype to phenotype/microbial strain comparison</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge [2]</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>Specialist knowledge</td>
</tr>
<tr>
<td></td>
<td>Employ good software development practices</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>Specialist knowledge</td>
</tr>
<tr>
<td></td>
<td>Apply computer science theory to computer system design</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>Specialist knowledge</td>
</tr>
<tr>
<td></td>
<td>Manage and organise genomics data and results</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Working knowledge</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>Working knowledge</td>
<td>Awareness</td>
<td>No knowledge required</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
</tr>
<tr>
<td></td>
<td>Apply statistical research methods to genomics, medical, and population genetics</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Working knowledge</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>Working knowledge</td>
<td>Awareness</td>
<td>No knowledge required</td>
<td>Awareness</td>
<td>Awareness</td>
</tr>
<tr>
<td></td>
<td>Use health informatics systems and understand their relevance to clinical genomics</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>No knowledge required</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
</tr>
<tr>
<td></td>
<td>Principles of genetics, genomics and genome-sequencing technology</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
</tr>
<tr>
<td></td>
<td>Principles of genetic disease</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Specialty knowledge</td>
<td>Awareness</td>
<td>No knowledge required</td>
</tr>
<tr>
<td></td>
<td>Principles of systems biology</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Working knowledge</td>
<td>No knowledge required</td>
<td>Awareness</td>
<td>Awareness</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
</tr>
<tr>
<td></td>
<td>Principles of Next-generation sequencing</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>No knowledge required</td>
<td>Awareness</td>
</tr>
<tr>
<td></td>
<td>Ethical, legal and social implications of clinical use of genomic data (including issues surrounding identification of patients, clinical benefits and risks, patient consent, incidental findings and ethical implications of unexpected clinically actionable findings)</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>Awareness</td>
<td>Awareness</td>
</tr>
<tr>
<td></td>
<td>Interpret genetic variation in a clinical context, including understanding limitations of analysis, assessing quality and evidence for clinical interpretation</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>Awareness</td>
</tr>
<tr>
<td></td>
<td>The role of various types of healthcare professional in genomic medicine</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>Working knowledge</td>
</tr>
<tr>
<td></td>
<td>The scientific discovery process and the role of bioinformatics in it</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>Awareness</td>
</tr>
<tr>
<td></td>
<td>The risks and benefits to patients and their families arising from the prediction of causal variants</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Specialist knowledge</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
</tr>
<tr>
<td></td>
<td>Integrate and jointly analyse genomic and other data</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
</tr>
</tbody>
</table>

LifeTrain’s collection of competency profiles

www.lifetrain.eu
Different phases of competency

- **N/A**
  - No competency in this area required

- **Awareness**
  - The professional appreciates what is possible in this area and how the area impacts on their own work

- **Working knowledge**
  - The professional has a firm underpinning knowledgebase in this area and applies it effectively in his or her day-to-day work

- **Specialist knowledge**
  - The professional actively contributes to advancement of the area, generating new understanding or new technology
Bioinformatics user

- Access data resources and bioinformatics tools to perform job duties in specific application domains:
  - Biocurator
  - Cytogeneticist
  - Genetic counsellor
  - Ethicist
Bioinformatics scientist

- Employ computational methods in order to advance the scientific understanding of living systems:
  - Research scientist (purely computational or lab-based)
  - Bioinformatician (e.g. in a core facility or supporting an experimental group or department)
Bioinformatics engineer

- Create novel computational methods needed by bioinformatics users and scientists
  - Software developer
  - Software engineer
How can you use the competency profiles?

• Think about which persona best matches the people you want to train; if none of them ring true, consider developing your own personas
• Think about which competencies your trainees need to develop
• Find courses or materials that have similar aims: you might be able to make use of these
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Breakouts

Group 1: User
Leads
• Celia
• Michelle

Group 2: Scientist
Leads
• Nicky
• Fran

Group 3: Engineer
Leads
• Pedro
• Patricia

Group 4: Mystery
Leads
• ???
Scenarios for breakouts

• Each breakout group will choose one scenario; we should ensure that we cover all three types of professional, but depending on the preferences of the audience we’ve got a bit of wiggle room.

• We have preselected leads for each group, and each group will need to select a scribe and a rapporteur.
Questions to address during breakouts

• Which competencies are needed for the scenario considered?

• What are the three most important competencies?

• Are you aware of/can you find appropriate training materials or courses from www.mygoblet.org/training-portal (or any other sources of bioinformatics training that you are aware of) that would meet these competency requirements?

• Is there anything that could be done to make the competency profiles more useful?
Reporting back

- The rapporteur has five minutes in which to report back to the group
- Tell us which scenario you chose and why
- Use slides, any other electronic means or flipcharts as audivisual cues to address each of the questions.
- The lead for each breakout has been given a copy of these slides
- You will all be given a briefing document, including a blank competency profile