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!
## Current draft

<table>
<thead>
<tr>
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<th>Bioinformatics scientist</th>
<th>Bioinformatics engineer</th>
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</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 genomics/genetics expertise</th>
<th>Other specialist clinician</th>
<th>Other clinician</th>
<th>Clinical genetic Scientist</th>
<th>Other healthcare scientist</th>
<th>Specialist nurse/counselor</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>6</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Example</td>
<td>NHS diagnostic bioinformatician [1]</td>
<td>Academic bioinformatician industry 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>Competency</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>No knowledge required</td>
</tr>
<tr>
<td></td>
<td>Analyse genomics data using pre-existing software, including linking genotype to phenotype/microbial strain compactness</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>Awareness</td>
<td>Specialist knowledge</td>
<td>No knowledge required[3]</td>
<td>No knowledge required</td>
<td>No knowledge required</td>
</tr>
<tr>
<td></td>
<td>Employ good software development practice</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>Working 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>Working 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>Awareness[4]</td>
<td>No knowledge required</td>
<td>No knowledge required</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>No knowledge required</td>
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<td></td>
<td>Use health informatics systems and understand their relevance to clinical genomics</td>
<td>Working knowledge</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>Awareness</td>
<td>Awareness</td>
<td>Working knowledge</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>Working knowledge</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>No knowledge required</td>
<td>Specialist knowledge</td>
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<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>Working knowledge</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>No knowledge required</td>
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<td></td>
<td>Principles of systems biology</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
<td>Specialist knowledge</td>
<td>No knowledge required</td>
<td>Awareness</td>
<td>Awareness</td>
<td>No knowledge required</td>
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<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>Awareness</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
<td>No knowledge required</td>
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<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>
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<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>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>
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<td>The role of various types of healthcare professional in genomic medicine</td>
<td>Working knowledge</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>Working 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>
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<td></td>
<td>The scientific discovery process and role of bioinformatics in it</td>
<td>Working knowledge</td>
<td>Awareness</td>
<td>Specialist knowledge</td>
<td>Working knowledge</td>
<td>Awareness</td>
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<td>Awareness</td>
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<td>The risks (and benefits) to patients and their families arising from the prediction of causal variants</td>
<td>Specialist knowledge</td>
<td>Awareness</td>
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<td>Specialist knowledge</td>
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<td>Integrate and jointly analyse genomic and other data</td>
<td>Working knowledge</td>
<td>Working knowledge</td>
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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 computational and 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
Acknowledgements

ISCB curriculum taskforce
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Breakouts

Group 1: User
Leads
• Celia
• Michelle

Group 2: Scientist
Lead
• Nicky

Group 3: Engineer
Leads
• Pedro
• Patricia

Group 4: Scientist
Lead
• Fran
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 audiovisual 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
Feedback from competency breakouts
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Bioinformatics user

- Didn't use either of the scenarios provided; used Leon's persona. Focused on someone who wants to know what tools are available and how to use them appropriately, especially to integrate different types of omics data.

- Were surprised to find that the most high priority competencies were the 'working knowledge' ones, not the 'specialist knowledge' ones.

- A2/N: redundancy in description of competency

- C1/D: Overlap (use vs abilities)

- Clarification needed for...

- C1: Process/Component - define

- D: 'Techniques' - what is meant?

- J: Analyse' - wrong verb? Understand?

- K: Unclear - stating the obvious?

- Should these competencies be able to be used to form/contribute to a job description?
Bioinformatics research scientist

- Used the scenario provided
- Identified required competencies and provided input on how to reword more clearly
- Provided info on what was missing:
  - Basic biostats knowledge
  - Study design
  - Adaptability: changing fields
  - Critical analysis
Bioinformatics core facility scientist

- Felt that the scenario provided needed to be amended to be more realistic
- Identified which competencies a core facility scientist would require
- Identified that personal qualities of the individual would have a major impact on who they would choose to undertake the project in the scenario
Bioinformatics engineer

http://pvanheus.github.io/goblet_competencies/index.html#2

- Differentiated team leader competencies vs team member competencies
- Team leader needs to be a bioinformatics scientist; team members need to be bioinformatics engineers
- Identified missing competencies:
  - Project management
  - Interpersonal skills
- Identified possibly appropriate training materials for engineers from the GOBLET training portal
Requests to the ISCB curriculum TF

- Tighter definition of some competencies
- Addition of new competencies (see suggestions in V5)
- Eliminate redundant competencies
- For each role, distinguish between entry-level, established (e.g. 5 y into role) and senior (e.g. 15 years into role)
- Provide a minimal standard at lower levels, e.g. what's the minimum that should be in an undergrad or a master's course for each role?
- Organise into blocks, esp. personal qualities vs scientific and technical competencies
- Provide clearer guidance on how the competency profiles can be used to develop/rework training
- [https://docs.google.com/spreadsheets/d/1hEvnrM4FGY2sx2EEynPRMehllw4_B-mGzYqTL8Vt7hk/edit?usp=sharing](https://docs.google.com/spreadsheets/d/1hEvnrM4FGY2sx2EEynPRMehllw4_B-mGzYqTL8Vt7hk/edit?usp=sharing) - V5 SA worksheet
What happens next

Cath to circulate the link to the TtT workshop delegates to sanity check accuracy

Combine with feedback from other workshops

Provide links to the latest version from the ISCB connect portal and the GOBLET website

Draft guidelines and circulate for input from the GOBLET and H3ABioNet communities
Thank you!