



# H3ABioNet

Pan African Bioinformatics Network for H3Africa

## **Training guide/support pack**

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*Disclaimer: This support pack summarises the major steps taken by H3ABioNet to plan/organise a short-term workshop or course. H3ABioNet often tailors these approaches depending on the needs of a training but examples have been provided where available. Most of the examples used all relate to a single course to illustrate a comprehensive implementation of this process.*

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## About the Training Guide – What, When and How to use it:

### What is this guide?

This document aims to serve as a general guideline to assist in developing and running training events. Events here loosely refer to workshops, courses, and may include hackathons and jamborees. This guide does not constitute the ONLY or ideal method of developing and running training but provides a comprehensive list of typical logistical considerations. Please feel free to navigate to and use sections relevant to your purposes.

### When to use this guide?

This guide will aid you in setting up a training event, beginning with the initial planning and take you through the subsequent steps to develop and deliver a successful training event.

### How to use this guide?

The user can navigate to the sections and(or) templates relevant to them or use the guide in its entirety as it incorporates the entire “life cycle” of a typical training event.

A schematic diagram is available to provide the user with a template timeline and key steps to focus on throughout the design process. A copy has been included in Phase 1 below, but an e-copy may be downloaded from: : <https://doi.org/10.25375/uct.14229752: Timeline>. The guide has also been colour-coded using vertical bars down the left-hand margin. These colours match sections/phases to their respective templates in Section B at the end.

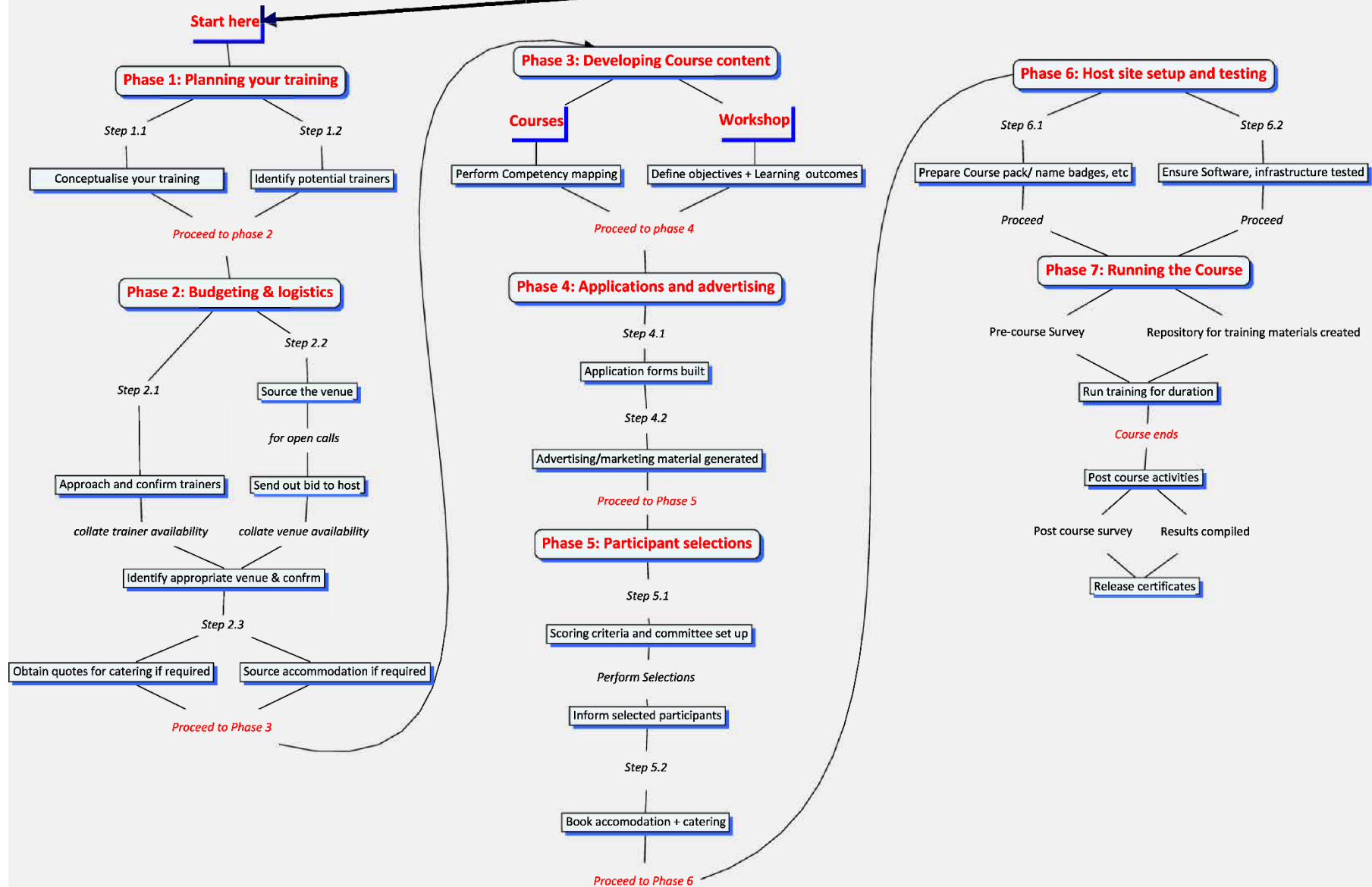
### Considerations for blended learning courses:

- Throughout this guide the acronym “**BLC**” (Blended learning consideration) has been used to precede text that highlights additional steps taken when developing & delivering blended learning courses.

### General notes and limitations:

- This document may refer to other tutorials or guides which may be consulted to supplement the information presented here.
- This guide requires users to have at least some background or experience in running training events to be used most effectively.

## Training Guide Workflow

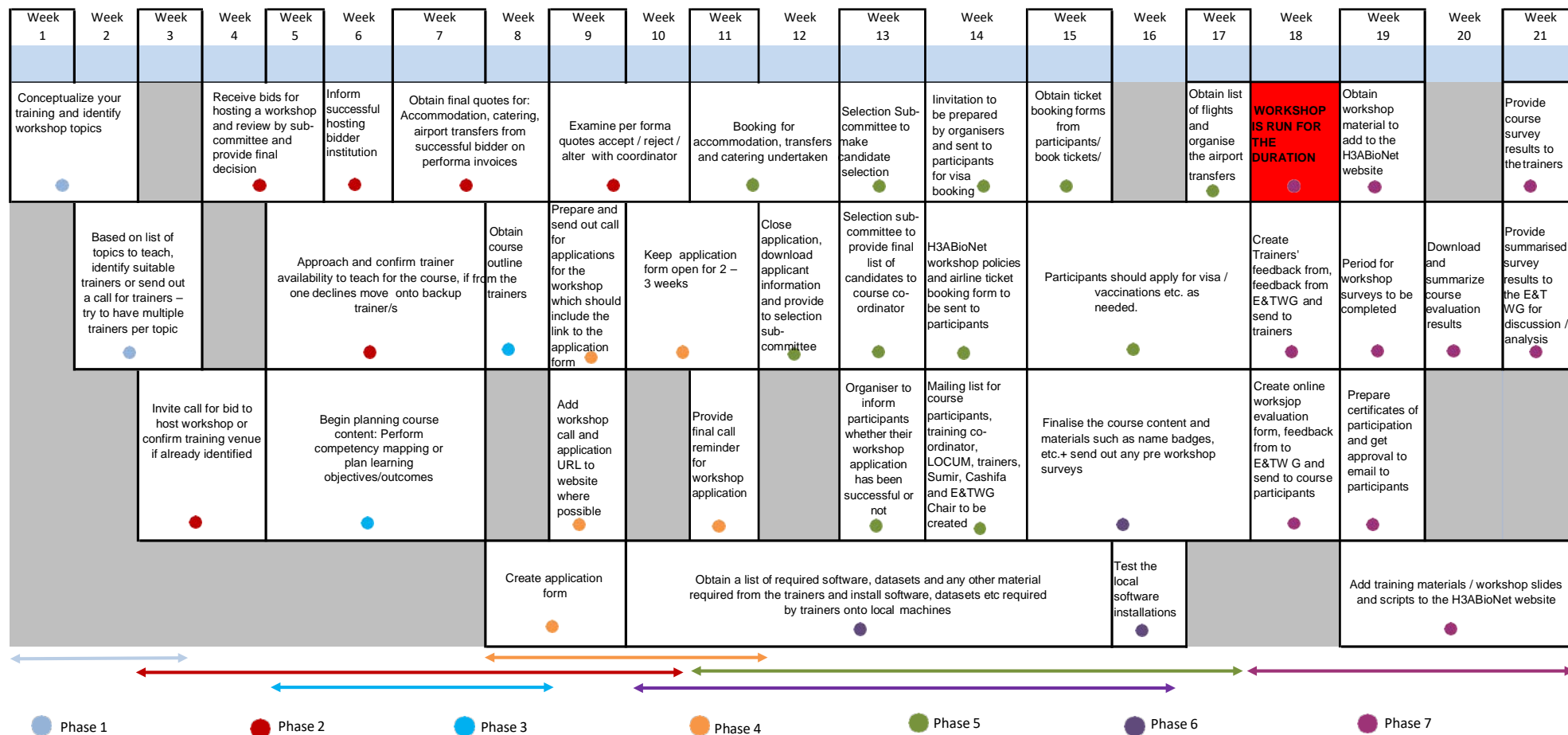


## Section A: The Training Guide:

### Phase 1 - Planning Your Training:

#### 1.1 Schematic timeline and logistical steps (considerations)

Planning training events encompasses a range of logistical considerations before, during and after your training. The diagram below has been included as a snapshot of all these activities for a standard 1-2-week workshop.



## 1.2 Complete the Course Planning Template:

A simple planning template has been developed and can be accessed and downloaded here:

<https://doi.org/10.25375/uct.14229752: Template 1> OR may be found under Section B: Template 1.

**The planning template may be used to execute the steps listed below**

- 1.2.1 Conceptualise your training i.e. what would you like to teach, how would you like to teach it and when would you like to teach it. Who will it target, etc.
- 1.2.2 Some general learning outcomes may be included here and is encouraged at this stage but may be refined or mapped to specific competencies later.
- 1.2.3 You are also encouraged to list any potential trainers in this document although these may still need to be confirmed; often these are the trainers you will begin to approach. You may want to do an open call for trainers, and instructions for this are provided in the “sourcing trainers” section below.
- 1.2.4 As you are planning your course the various roles required to effectively manage the course should become apparent. At this point it would thus also be highly beneficial to define the roles of all involved in the course, e.g. who will be responsible for administering course surveys, who will manage advertising, who will source quotations for accommodation, etc.

## 1.3 Source Trainers:

*Please note: this could be a very lengthy process so it is good to start this as early as possible but you may need move on to other planning activities while awaiting confirmation, etc. Ideally trainers should be sourced before advertising, but this is most often not the case. Be flexible but bear in mind that no course can run without a suitable trainer and the quality of trainer can make the course a success.*

**Steps to follow:**

- 1.3.1 H3ABioNet maintains an active list of current and potential trainers and their relevant fields of expertise, which you are free to mine for appropriate trainers. This list is being curated on HtrainDB and you will have access to this trainer bank if you are an H3ABioNet/H3Africa member.
- 1.3.2 If you do not have access to or already know potential trainers, a call for trainers can be sent out.
- 1.3.3 Trainers can then be selected based on their level of expertise, etc.

## Key points to note at the end of phase 1:

- During this phase you do not yet need to refine any content, etc. You just need to have a clear idea on what your training will cover.
- You need to have identified major topics or content you would like to teach – you cannot source trainers if you do not know what you will teach.



- Some clear objectives or learning outcomes may be listed at this point to drive material development but again they do not need to be in a final state – they will most likely change by the end.
- It is important to have this ready as a reference guide for your core team and it is important to regularly update this document as items are finalised.
- Once in a stable (but not necessarily final) state, this content can be easily adapted for advertising and marketing your training.

## Phase 2: Budgeting & Logistics:

### 2.1 Sourcing venue/hosting site:

**For pre-determined venues** - simply ensure that the venue is booked at this stage and proceed to budgeting and costing.

**If the venue needs to be sourced**, this can be done in **two** main ways:

1. **Identify appropriate local or international venues** that meet the requirements for your training i.e. if you need a projector or uncapped internet bandwidth, ensure they can provide this.
  - a. Obtain quotations and booking requirements for the preferred venue. Most venues will have a daily conference package that charges a standard fee per person per day depending on your requirements. This can be used to track expenses and overall budgeting – see budgeting section below for templates and examples.
  - b. Select preferred venue based on required specifications and available budget.
  - c. Inform venue of your potential booking.
  - d. Collate dates that venue is available and obtain costing for duration of the course.

2. **Send out a call to bid to host a workshop or course** – template available here: <https://doi.org/10.25375/uct.14229752: Template 2> OR may be found under Section B: Template 2.

The following steps are recommended:

- a. Release call to bid to host a workshop.
- b. Set up committee to review bids.
- c. Once deadline passes – committee to review bids and make selection for hosting institution/s.
- d. Alert successful institution.
- e. Obtain venue availability from winners.
- f. Proceed to next logistical steps.

### 2.2 Sourcing Accommodation:

If accommodation needs to be acquired, it is advisable to begin sourcing quotations from at least three independent providers. Based on the number of participants the venue and your budget are able to accommodate, attempt to block book rooms (if the hotel/ accommodation allows block booking). Be sure to know when the final date to confirm your numbers to the hotel is, to ensure you do not incur additional charges. See section 2.4 for templates and guidance.

### 2.3 Sourcing Catering:

During this phase it may be difficult to book catering as exact numbers will depend on the dietary requirements of the participants, but as with the venue, quotations may be obtained from various caterers at this stage for any meals you wish to provide. Here it is advisable not to commit to any particular caterer as your final choice will depend on the needs of your participants and may also be influenced by institutional policies. See section 2.4 for templates and guidance.

## 2.4 Overall Budgeting & Costing:

Create an overall budget for your workshop/course which can be created by using the following **3 costing sheets**:

### 2.4.1 Venue costs - DCP rates:

- The following template may be used to obtain the Daily Conference Package (DCP) rate from the provider (per person) – (it has been prefilled with example data):  
<https://doi.org/10.25375/uct.14229752: Template 3> OR may be found under Section B: Template 3.
- This template can then be used to track the DCP rate per person per day:  
<https://doi.org/10.25375/uct.14229752: Template 4> OR may be found under Section B: Template 4.

### 2.4.2 Cost of accommodation per person per day (if using the same venue for both conference and participants):

- This template may be used to track the cost of the accommodation per person per day:  
<https://doi.org/10.25375/uct.14229752: Template 5> OR may be found under Section B: Template 5.

### 2.4.3 Catering – cost per person per day:

*Please see DCP sheet above. These sheets may be used if catering needs to be ordered separately.*

## 2.5 Trainer availability:

- a) Determine availability of trainers and align to availability of venues.
- b) Select optimal dates and identify trainers whose availability matches.
- c) Confirm dates for course internally.

## Phase 2 BLC:

- a. When delivering blended learning courses, training generally runs across multiple hosting classroom sites but in order to find suitable sites to host your course, a call for interested classrooms may be advertised that may encompass similar questions to the bid to host a workshop found in section 2.1 above. Key criteria to focus on here would be infrastructure or technical requirements, availability of the classroom site, etc. An example of a **classroom application form** may be accessed here:  
<https://redcap.h3abionet.org/redcap/surveys/?s=PC7NDKTC4X>.
- b. Each hosting site will also require support staff who are experienced enough to facilitate the classroom. Often bioinformatics courses will require both teaching assistants as well as a system administrator. Once again, an open call for volunteers to act as teaching assistants and system administrators can be circulated. Here the questions asked will be based on required expertise but an example of each can be found here:  
**System administrator:** <https://redcap.h3abionet.org/redcap/surveys/?s=RYKFDAM3J4>  
**Teaching assistant:** <https://redcap.h3abionet.org/redcap/surveys/?s=TY7M3KN8M8>

## Key points to note at the end of phase 2:

- At the end of phase 2 it is important to have identified your preferred training venue

- It is vital that you confirm the training venue here as all other logistical considerations may centre around this.
- At this stage it is also vital to have confirmed all trainers. No further planning should continue until trainers have been confirmed as they may have special infrastructural (or other) requirements that may influence course planning and logistics.
- It is important to source quotations from multiple providers and to ask for multiple options. Your final options can be chosen at a later stage based on your budget.

## Phase 3: Developing and Refining Content:

Different approaches are often required when developing content for a workshop versus a course and the suggested steps are listed below.

### 3.1 If you are developing a **workshop**:

- You should have listed a few objectives/learning outcomes while completing the planning documents.
- Now it is necessary to list some specific outcomes and objectives for the training and to finalise these objectives. If you need some guidance on developing learning outcomes, please find a simple guide here: <https://doi.org/10.25375/uct.14229752: Appendix 1> OR may be found under Section C: Appendix 1
- Try to develop at least 5 learning objectives for your course but feel free to include more (or less) if necessary.

### 3.2 If you are developing a **course**:

- You should have developed some learning outcomes during the planning phase. Use these learning outcomes to perform more elaborate competency mapping.
- Your course may cover one specific competency or many.
- A short guide has been developed to assist users in applying competencies when developing (Bioinformatics) courses. This guide may be accessed here: <https://doi.org/10.25375/uct.14229752: Appendix 2> OR may be found under Section C: Appendix 2.
- Remember to develop each topic/module in line with the competencies chosen to ensure competency is developed at an acceptable level.

### 3.3 Creating a course/workshop outline:

Once competency mapping is complete or learning outcomes are well defined, work alongside trainers to develop a course outline – this will be used as input into phase 4. The following template may be used to refine various topics or modules - <https://doi.org/10.25375/uct.14229752: Template 6> OR may be found under Section B: Template 6.

### Key points to note at the end of phase 3:

- Learning objectives, outcomes and(or) competencies must be clearly defined.
- Trainers must begin to develop detailed course content and highlight any logistical requirements that may not have been identified during the planning phase.
- As trainers begin to finalise content it is important to maintain communication with your training venue to ensure they meet your required specs or ensure they can obtain those specs in time.

## Phase 4: Participant Applications and Communications (Advertising):

### 4.1 Application forms - Participants:

It is advisable to create an application form to collect applicant information. This will create a central repository for storing applicant data and allow for an easier and smoother selection process.

An example H3ABioNet participant application form can be accessed here:

<https://doi.org/10.25375/uct.14229752>: [Template 7](#) OR may be found under Section B: [Template 7](#).

### 4.2 Advertising your training:

- 4.2.1 In order to advertise and create awareness around your course, it is advisable to create an advertisement which will be used to announce that applications have opened. Advertising ahead of participant applications is encouraged to ensure enough time to create awareness about the training.
- 4.2.2 Please include as much information about the course (without the advert becoming too cluttered) as possible and make use of the course outline document you have created in the previous step.
- 4.2.3 Key information to focus on will be the location and time of the training; course objectives and any prerequisites required, as well as what participants may be expected to gain from the course.
- 4.2.4 It would be beneficial to collect the information listed in the H3ABioNet workshop call template, which may be accessed here: <https://doi.org/10.25375/uct.14229752>: [Template 8](#) OR may be found under Section B: [template 8](#). This information will assist potential applicants determine whether the course is appropriate for them.
- 4.2.5 Some great channels for advertising your course include Facebook, twitter, LinkedIn, Mailchimp as well as organisational mailing lists and websites.  
An example of each has been included below:
  - **Facebook:** <https://www.facebook.com/H3ABioNet/photos/a.1420080618304786/2447119975600840/?type=3&theater>
  - **Twitter:** <https://twitter.com/H3ABioNet/status/1237002509350297611?s=20>
  - **Mailchimp (viewed online) here:** [https://mailchi.mp/db89cf45637e/call-to-host-a-classroom-for-ibt\\_2018-18339675?e=13ab995931](https://mailchi.mp/db89cf45637e/call-to-host-a-classroom-for-ibt_2018-18339675?e=13ab995931)
  - **Web-page:** <https://www.h3abionet.org/categories/training/introduction-to-bioinformatics-training-2020>
- 4.2.6 H3ABioNet has a Mailchimp account used to deliver email campaigns to the consortium to alert them when a course application has opened. If you are running an independent course, it is generally commonplace to have at least a static web page or pdf advertisement that may be circulated to advertise the intake of your course. A simple Mailchimp account may also be created at little to no cost but will have several limitations.
- 4.2.7 Participant applications should ideally remain open for at least 2 weeks to allow enough time for the course announcements to circulate, etc.

#### 4.3 Trainers continue to develop course content:

- 4.3.1 During the participant application period, trainers should continue to refine and develop course content. They should be approaching the final stages of the development process.
- 4.3.2 Tools/software required by trainers can be finalised here and local staff can begin to install and prepare required software, etc.
- 4.3.3 When the participant application period closes, the course should be in an advanced stage of development and testing, if necessary, should commence.

#### Key points to note at the end of phase 4:

- Toward the end of phase 4, trainers should be finalising their content.
- At this stage it would also be ideal to create an advertisement for your course. This could be a simple pdf file, web-page, twitter ad, etc. but it is vital that you create awareness about your course.
- It would also be advised to create a formal application form to track and store participant data (be aware of any data protection laws that may exist locally). Remember to ask for consent on any form collecting personal data.

## Phase 5: Participant Selections:

### 5.1 Selecting participants – determining a selection committee:

- a) If a formal selection committee is required, ensure appropriate persons are selected.
- b) Set clear unambiguous scoring criteria, this can be provided to the selection committee.
- c) Determine upfront whether you will have any exclusionary criteria.
- d) Determine what level of personal information will be provided to selection committee e.g. no identifying information provided, only application numbers; information on gender provided or excluded, etc.
- e) It is advised that any personal information such as names, email addresses and institutions be removed but would recommend including gender and country where applicable to promote diversity.
- f) Selection committee to feedback selected participants to core team or organiser.
- g) Core organiser/s to communicate successful application to participant – see 5.2.

### 5.2 Once a participant has been selected:

- a) The participant should receive a formal acceptance that may include a separate acceptance letter. An example of an acceptance letter/email can be accessed here: <https://doi.org/10.25375/uct.14229752: Template 9> OR may be found under Section B: template 9.
- b) Ideally, a Workshop policy document should be provided to the participant to make them aware of any rules surrounding the course or simply just inform them of expected conduct during the workshop. An example of the H3ABioNet workshop Policy can be found here: <https://doi.org/10.25375/uct.14229752: H3ABioNet Workshop Policy>.
- c) Media consent forms should be completed by ALL who attend the workshop in the event that any images, etc. may be taken. An example media consent form may be accessed here: <https://doi.org/10.25375/uct.14229752: Template 10> OR may be found under Section B: Template 10
- d) Any additional data consent forms that may be required to remain compliant with local data protections laws, etc. may also be provided.
- e) Request participants to formally accept their position in the course to ensure those who are no longer interested may be replaced with other deserving candidates.

### 5.3 Travel and accommodation:

The steps listed below may be considered for this:

- a) Generate invitation letters as soon as selections are completed for those who require visas. An example invitation letter can be found here: <https://doi.org/10.25375/uct.14229752: Template 11> OR may be found under Section B: Template 11.
- b) Instruct successful participants to apply for visas where necessary as early as possible.
- c) To assist with travel arrangements, this travel booking form may be used and modified as needed to assist with booking batch flights -



<https://doi.org/10.25375/uct.14229752>: Template 12 OR may be found under Section B: Template 12

- d) At this point accommodation and catering may now be booked/confirmed
- e) Plan airport transfers if this will be covered.
- f) The following template may be used to assist with, but also track the airport transfers of your attendees - <https://doi.org/10.25375/uct.14229752>: Template 13 OR may be found under Section B: Template 13 (*This template will only become applicable once flight arrangements have been made*).

### Phase 5 BLC:

- a) In the case of blended learning courses, applications are made to each hosting classroom. Participants select a classroom closest to them (that they are able to attend in person).
- b) Thus, each hosting site must perform their own independent participant selections which are then provided to the organisers for inclusion in course websites, or similar. Here you must be sure to provide clear selection criteria and instruction to the hosting sites.
- c) You will also need to decide whether you will communicate acceptance to each participant or whether that will be the responsibility of each host. Here travel and accommodation will not need to be sourced for successful participants as hosting classrooms should be local.

### Key points to note at the end of phase 5:

- By the end of phase 5 you need to have selected your final set of participants
- Course information should be provided to them including policy documents, consent forms, etc.
- Any travel arrangements should be dealt with during this phase as well.
- Note this phase may start much earlier if you already know who your participants will be.

## Phase 6: Hosting Site Set-up and Final Testing:

### 6.1 Setting up your site:

- a) While participants are being selected, ensure any required software, etc. is installed (as per your course outline document) and that participants have logins and internet access where required.
- b) Ensure a period to test that all software and infrastructure performs as required – this can be done roughly one month to 2 weeks prior to the course depending on the intensity of the content.
- c) Ensure any technical issues are resolved, all platforms are well tested and all required software is installed.

### 6.2 Preparing for the course:

The following activities should be completed BEFORE the start of your course:

- a) Compile course pack – biographies, course content, agenda, etc.  
A template to collect biographies can be found here:  
<https://doi.org/10.25375/uct.14229752: Template 14> OR may be found under Section B: Template 14.
- b) Prepare and print name badges, etc. Be sure to test any designs. An example name badge may be found here: <https://doi.org/10.25375/uct.14229752: Template 15> OR may be found under Section B: template 15.
- c) Administer a pre-workshop/training survey ahead of the course to allow you to assess the impact of the training. Examples of questions that may be asked during a pre-course survey can be found here: <https://doi.org/10.25375/uct.14229752: Template 16> OR may be found under Section B: Template 16.
- d) Catering: ensure caterers receive workshop/course schedule well ahead of the course in order to coordinate teas and lunches/dinners.

### Phase 6 BLC:

Here it is necessary to ensure all required testing and associated staff training has been completed at each hosting site.

### Key points to note at the end of phase 6:

- Here you would want to begin testing your course content for any bugs, etc.
- You may also want to perform some site inspections and visits at your selected training venue.
- Since this phase is essentially the preparatory phase to run your upcoming training, it would be a good time to send any pre-course surveys and information you may need to collect from participants.
- Also ensure all catering, etc. has been finalised.

## Phase 7: Delivering the Training/Course:

### 7.1 Delivering the course:

- a) Ensure materials are available in a timely manner and that trainers and teaching assistants are available and present.
- b) Run the training following the schedule as closely as possible.
- c) Ensure attendance is monitored and recorded.
- d) It is also advisable to have a central repository for resources that can be accessed by both trainers and participants where slides, code, etc. may be uploaded for easy access (for example a Google drive/one drive).

### 7.2 Post-course Activities

- a) Once the training has been completed: administer a post-workshop survey to determine the impact and success of the course. An example of a post-workshop survey can be located here: <https://doi.org/10.25375/uct.14229752: Template 17> OR may be found under Section B: Template 17. The questions you ask during your post-training survey will be specific to your course.
- b) All survey results should be disseminated to trainers and reviewed for future improvements and to assess impact.
- c) Record student results where applicable and determine grades if required.
- d) Generate course completion certificates. The H3ABioNet certificate template for H3ABioNet sponsored courses can be requested if required and an example may be accessed here: <https://doi.org/10.25375/uct.14229752: Template 18> OR may be found under Section B: Template 18. Please note you will not be able to use an H3ABioNet certificate template (if you are an organisational member) without the explicit permission from the head of H3ABioNet. Please contact [info@h3abionet.org](mailto:info@h3abionet.org) should you wish to use this template.
- e) When issuing certificates, it is good practice to generate a UUID for each individual certificate which must be safely stored. This ensures the certificates validity and ensure certificates can be queried and verified.

### 7.3 Making training materials FAIR:

Often training events generate many different training materials, from documents to presentations and associated files. With many training providers and organisations now opting to place many materials onto online websites and repositories, in order to improve the findability of courses and these materials, we suggest using a standard schema to mark-up all materials.

The Bioschema.org community have developed a set of specifications for marking up training courses and materials on websites in order to improve FAIRness. These are listed below:

- a) Specification for **Courses**: [https://bioschemas.org/profiles/Course/0.9-DRAFT-2020\\_12\\_08/](https://bioschemas.org/profiles/Course/0.9-DRAFT-2020_12_08/).
- b) Specification for **Course Instances**: [https://bioschemas.org/profiles/CourseInstance/0.8-DRAFT-2020\\_10\\_06/](https://bioschemas.org/profiles/CourseInstance/0.8-DRAFT-2020_10_06/).
- c) Specification for **Training Materials**: [https://bioschemas.org/profiles/TrainingMaterial/0.9-DRAFT-2020\\_12\\_08/](https://bioschemas.org/profiles/TrainingMaterial/0.9-DRAFT-2020_12_08/).

Each specification contains a list of properties (fields) that are considered mandatory, recommended and optional. In order to be compliant with the schema, all mandatory properties must be present and marked up on your website. The minimum properties for each specification have been listed below along with a marked-up example.

#### Course:

```
Description < "description": "This is a course ran at an institution. It's ran periodically - specific courses can be found through CourseInstances" >  
Keywords < "keywords": "RNA-Seq, Workshop" >  
Name < "name": "My Course" >
```

#### Course Instance:

```
Course mode < "name": "My Course" >  
Location <  
    "location": {  
        "@type": "Place",  
        "address": {  
            "@type": "PostalAddress",  
            "streetAddress": "1.17, Kilburn Building, University of Manchester",  
            "addressLocality": "Manchester",  
            "addressRegion": "Greater Manchester",  
            "addressCountry": "United Kingdom",  
            "postalCode": "M13 9PL"  
        }  
    }  
>
```

#### Training Materials

```
Description < "description": "This tutorial will take you through the basic usage of the command line shell. In it, you will discover what a shell is, skills for directory navigation, file manipulation, and how to run tools. To complete this training material you will need to have a shell (linux), powershell (windows), or terminal (mac) ready. You do not need any previous experience to complete the tasks" >  
Keywords < "keywords": "Unix, Shell, Command Line Tools, Terminal, Bash" >  
Name < "name": "The Unix Command Line tutorial for Bioinformaticians" >
```

H3ABioNet, however regularly collects specifications that are mandatory, recommended and in some cases optional. We have developed a standard template containing the list of fields that should ideally be completed when placing content online, which can be found here: <https://doi.org/10.25375/uct.14229752: Template 19> OR may be found under Section B: Template 19.

#### Key points to note at the end of phase 7:

- During this phase you will run and deliver your training.

- Here it is vital that all course materials are ready including, course notes, name badges, attendance registers, etc.
- Once your training concludes you should ideally also deliver a post-course survey to evaluate the training for potential improvements.
- You may also want to share your training materials more widely by uploading to a public repository and making them FAIR.

## Section B – Templates:

### Template 1: Course/workshop planning template

#### Logistics

**Course Title:** E.g. 16S intermediate training

**Suggested dates:**

**Course organisers:**

**Registration opens:**

**Registration closes:**

**Course Sponsors:**

#### Participant Information

**Intended Audience:**

**Prerequisites:** (examples below)

- Some familiarity with R
- Basic knowledge of molecular and cell biology
- Preferably will be working with 16S data in the near future

#### Classroom Information

**Technical requirements**

[list technical requirements for classrooms here](#) if required

**Support staff: Required:**

- E.g. Minimum of one TA

**Support staff expertise: (examples listed)**

- Experienced in Linux and the Unix shell
- Experienced in R
- knowledge of molecular biology

#### Course information

**Objectives:** After this workshop participants should be able to:

[List some objective here:](#)

#### Suggested topics:

Topic	Potential trainer	Resources available	comments
Introduction to the Linux command line / intro to R	Gerrit/Katy	<a href="#">Unix intro</a> , <a href="#">Shell tutorial</a> , <a href="#">R tutorial</a>	

## Template 2: Call to bid to host a workshop

Node, venue, accommodation, catering information	
<b>Institution Details</b>	
Institution Name	
City of Location	
Country of Location	
<b>Details of Venue Infrastructure where the Workshop will be hosted</b>	
Venue for workshop	
Number of people the venue can host (count of desks and chairs)	
Is the venue a dedicated computer training lab (Yes / No)?	
Number of computers available for the workshop	
Operating System (OS) of those computers	
Does the venue have audio visual facilities e.g projector (Yes / No)?	
Does the venue have access to internet (Yes / No)?	
What is the internet speed / bandwidth that would be available for training purposes?	
Will the venue be available for the duration of the workshop and 5-10 days beforehand for installation of software / virtual machines?	
Is the training venue available to your institution free of charge, or will the venue need to be hired?	
<b>Details of IT Support / Infrastructure Available</b>	
Memory and RAM of those computers available for training	
Does the bidding institution administer those computers or are they administered by an Institutional IT department?	
Would the IT department allow the machines to be converted to Linux OS or allow installation of Virtual machines?	
Would the IT department allow the machines to be installed with software required for the training workshop?	
Is there a dedicated Systems administrator / IT personnel assigned to that training venue?	
Will the institution bidding to host the workshop be able to secure the services of a dedicated IT personnel for installation of software?	
Does the dedicated Systems Administrator / IT personnel secured have experience in installing software in a Linux environment (Yes, number of years / No)?	

Location of Venue and Accommodation	
Will accommodation be provided on the same site as the training venue or at a different location?	
How far is the accommodation venue from the training venue?	
How far is the accommodation venue from the airport?	
How will transport from the accommodation venue to the training venue occur?	
How are the public transport links to the accommodation and training venue?	
Details of Accommodation and Catering	
How many people can the hotel accommodate?	
Does the hotel have the available capacity for the number of participants and trainers on the required dates?	
Will the hotel provide breakfast and dinner inclusive of their quote (half board)?	
Does the training venue have a facility for lunch or catering?	
Does the hotel make any specific provisions for special diets?	
How many stars is the accommodation venue rated?	
Details of Local Administrative Support and Experience	
Is there a local administrative assistant available to co-ordinate and send letters of invitations, obtain quotes, organize flight transfers and make bookings?	
How many people from your institution will be able to help with organizing the workshop?	
Has your institution hosted any training workshops in the past (if Yes, please provide dates and workshop names)?	



Template 3: Used to obtain DCP rates from venue

	1st November	2nd November	3rd November	4th November
<b>Number of people for DCP rates</b>	40	38	34	30
<b>Number of vegetarians</b>	7	7	7	6
<b>Morning tea break times</b>	10:30am to 11:00am	10:30am to 11:00am	10:30am to 11:00am	10:30am to 11:00am
<b>Lunch time break times</b>	12:30pm to 2:00pm	12:30pm to 1:30pm	12:30pm to 2:00pm	12:30pm to 2:00pm
<b>Afternoon tea break times</b>	3:30pm to 4:00pm	3:30pm to 4:00pm	3:30pm to 4:00pm	NO AFTERNOON TEA BREAK AS END AT 2PM
<b>Cost to use venue per day</b>				

## Template 4: Tracking the DCP rate per person per day

Accommodation XX DCP half day conference package							
First name:	Last name:	28th August	29th August	30th August	31st August	1st September (end at 2pm)	
Person A	Person A	344	365	365	365	365	1
Person B	Person B	344	365	365	365	365	2
Person B	Person B	344	365	365	365	365	3
TOTAL		1032	1095	1095	1095	1095	<b>5412</b>
Notes:	<i>Meeting starts at 8:30 and ends 5pm apart from the 1st of September</i>						
	<i>Please only provide tea breaks between 10:30am to 11:00am and 3:30pm to 4:00pm. Do not provide morning tea / coffee at 9am</i>						

# Template 5: Cost of accommodation/venue per person per day

Line Item	Cost / description	Cost / description	Cost / description
Venue Name			
Venue website url			
Region located			
Venue telephone number			
Venue contact person / s			
Venue contact persons' emails			
Venue contact persons telephone			
Number of rooms available between 8th Oct to 14th October 2017			
Cost per a room per a night			
Group discount for block booking cost per a room (~40 to 50 rooms)			
Conference facilities available on 9th of October 2017			
Daily Conference Package (DCP) rate per a person			
Total cost of DCP for 60 people per a day (full package)			
Total cost of DCP for 60 people per a day (half package)			
Lunch included in both conference packages (yes / no)			
Internet (free or paid for?)			
Projector (free or need to hire)			
Sound system / PA and number of microphones			
Dinner facilities / restaurant available			
Average cost per a dinner meal			
Cost per an airport transfer			
Cost of transport to UVRI			

## Template 6: Course/workshop outline

### Course information:

### Course summary:

### Overall learning outcomes:

*Examples provided below:*

*On completion of the course, participants should be able to:*

- *Use the unix command-line as a tool for data analysis*
- *Describe the different NGS data file formats available*
- *Perform QC assessment of high throughput sequencing data*

### Topics:

### Target audience:

### Schedule:

### Module developers – Lead/Co-Leads:

*Appendix (include any guideline documents related to content development such as breaking down content for remote classroom format, how to write LO's, designing assignments etc...)*

---

### Contents:

#### Module 1:

#### Module 2:

#### Module 3:

---

#### Module 1:

- **Module Lead/Co-lead**
- **Summary or objectives** – what you plan to cover for this module
- **List of learning outcomes specific for this module** (Please list 3 - 5 Learning Outcomes here; refer to How to writing learning outcomes)
- **Total number of hours/days to be spent on this content:**
- **Tools/software and resources to be used**
  - **Software**
  - **Description of datasets to be used** (if known)
  - **Other resources, or readings**

- **Overview of activities and exercises** (list specific practical activities which participants will do)  
Introduction lecture:  
Exercise/Activity 1:  
Exercise 2:  
Exercise 3:
  - **Assessment**  
Assignment 1:
  - **Competencies/outcomes**  
If you are comfortable with competencies, please list the competency/ies this module will address:
- 

#### Module 2:

- **Module Lead/Co-lead**
- **Summary or objectives** – what you plan to cover for this module
- **List of learning outcomes specific for this module** (Please list 3 - 5 Learning Outcomes here; refer to How to writing learning outcomes)
- **Total number of hours/days to be spent on this content:**
- **Tools/software and resources to be used**
  - **Software**
  - **Description of datasets to be used** (if known)
  - **Other resources, or readings**
- **Overview of activities and exercises** (list specific practical activities which participants will do)  
Introduction lecture:  
Exercise/Activity 1:  
Exercise 2:  
Exercise 3:
- **Assessment**  
Assignment 1:
- **Competencies**  
If you are comfortable with competencies, please list the competency/ies this module will address:

## Template 7: Example application form

### H3Africa Chip Data Analysis Workshop

Faculty of Health Sciences, University of Cape Town, South Africa September 2018

Please complete the application form below if you want to apply for the H3Africa Chip Data Analysis (GWAS) Workshop. Please note, in order to be considered for the physical workshop, applicants will be required to complete a series of online lectures and to begin applying pipelines to their data (or a dataset). Please keep this in mind before proceeding to complete the application.

#### PERSONAL DETAILS

Title:

---

First name:

---

Last name:

---

Email:

---

Application country:

---

Do you have any special dietary or medical requirements?

---

#### VISA REQUIREMENTS

Visa required?

☐  
☐

Yes  
No

Passport name:

---

Passport number:

---

Nationality:

---

Address:

---

Date of birth:

---

#### BACKGROUND / WORK

Education background:

☐  
☐  
☐  
☐  
☐  
☐  
☐

Biological Sciences  
Computer Science  
Mathematics  
Statistics  
Physical Sciences  
Bioinformatics

Institution: \_\_\_\_\_

Role: \_\_\_\_\_

(Describe your role/responsibilities at your institution \_\_\_\_\_

## RELEVANT EXPERIENCE

Do you have experience in Unix/Linux and tools used for GWAS? ☐ Yes ☐ No

Please elaborate: \_\_\_\_\_

Previous GWAS or Medical Population Genetics courses: \_\_\_\_\_

Expectations from this workshop: \_\_\_\_\_

Motivation:  
(Please provide motivation detailing your suitability/eligibility for this course (500 words max)) \_\_\_\_\_

Please find the H3ABionet workshop policy here, which all selected applicants must abide by. Please read the policy carefully and take the time to familiarize yourself with what would be required of you when attending the workshop.

I have read and agree to abide by the H3ABioNet workshop policy if selected. ☐ Yes ☐ No

\_\_\_\_\_

## Template 8: Workshop call template



**Workshop Title:**

**Venue of workshop:**

**Dates for the workshop:**

**Workshop organisers:**

**Registration opens:**

**Registration closes:**

**Notification date:**

**Link to application form:**

**Participation:**

**Workshop Sponsors:**

**Course Overview:**

**Intended Audience:**

**Syllabus and Tools:**

**Prerequisites:**

**Objectives:** After this workshop participants should be able to:

- 

**Workshop limitations:** This workshop will only provide a foundation for continued learning in

**Workshop Programme:**

Time	Topic	Trainer
<b>27<sup>th</sup> July 2018</b>		
	Registration and Introductions	
10:30	<b>Tea Break</b>	
11:00		
1:00	<b>Lunch</b>	
2:00		
3:30	<b>Tea Break</b>	
6:00	<b>Workshop End</b>	



## Template 9: Acceptance email example

Subject: Application to attend the H3ABioNet Chip Data Analysis and GWAS workshop

Dear XY,

It is with great pleasure that we inform you for your successful application to attend the H3ABioNet H3Africa Genotyping Chip Data Analysis and GWAS workshop to be held in Cape Town between the 8<sup>th</sup> to the 12<sup>th</sup> of October 2018.

Please find the following documents attached to this email:

- b) Confirmation of your selection and award of an H3ABioNet Travel Fellowship to attend the workshop
- c) H3ABioNet\_workshop\_airline\_ticket\_booking\_form\_2018 – an airticket booking template for completion to enable us to arrange your travel to Cape Town
- d) H3ABioNet\_biography\_template\_2018 – a biography template for completion to pass onto the trainers
- e) H3ABioNet\_GWAS\_lecture\_series\_schedule\_2018.pdf – a schedule of the online lectures that are compulsory to attend in order to keep your place in the hands on practical workshop
- f) Slack\_users\_guide\_summary.pdf – a quick guide on Slack. We will be using Slack to communicate as a group before the practical workshop

To do:

- a) Please complete documents in points 2 and 3 above and email them back by the 22<sup>nd</sup> of August 2018
- b) Please join the Slack group by the 27<sup>th</sup> of August. The Slack group for this workshop is available at: [<link to channel here>](#)

Please do not hesitate to contact us in case of any queries you may have.

Thank you,  
Course organiser name

## COPYRIGHT RELEASE/CONSENT FORM

This form is provided to you as a participant/speaker at a H3ABioNet event. H3ABioNet would like to capture one or more of the following: photography, recorded images, audio, presentation and comments for the purpose of publication, promotion, illustration or advertising. Possible uses include but are not limited to, use within our website, marketing materials and distribution amongst H3ABioNet consortium partners. This release does not restrict you from using your photographs/videos elsewhere in any way. H3ABioNet is committed to using your images/videos in ways that make sense to you.

### PLEASE COMPLETE AND SIGN THE BELOW SECTION:

Name of workshop/conference/event: <Name and Date of training event>

I, \_\_\_\_\_ (please print name), grant permission to H3ABioNet and/or parties designated by H3ABioNet to photograph/video me and reproduce such photographs/videos /presentations, in all media forms for any promotional purposes including, illustration, exhibition and advertising or any other non-commercial use.

I further consent to the use of my name, in connection with the photograph(s)/video(s), if needed, by H3ABioNet and/or parties designated by H3ABioNet. I hereby release H3ABioNet of any claims or liability and any royalty for the publication of the photographs/videos/presentations or the use of my name.

Check each of the boxes to **agree/disagree** to the conditions of this release:

Agree	Disagree	
-------	----------	--

- |                          |                          |  |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | I acknowledge that I am over the age of 18   |
| <input type="checkbox"/> | <input type="checkbox"/> | I give H3ABioNet permission to use my name and biographic information to promote, or advertise H3ABioNet activities.                     |
| <input type="checkbox"/> | <input type="checkbox"/> | I understand the possible uses of my images/videos/presentations include but are not limited to: publication, promotion and advertising. |
| <input type="checkbox"/> | <input type="checkbox"/> | I acknowledge that this is a legally binding agreement and verify that I have the authority to enter into this agreement.                |

I certify that I have read and fully understand this consent and release

X

Full name

X

Signature

X

Date

## Template 11: Example invitation letter

### **Name of training e.g. <chip data analysis workshop>**

<Name of invitee>,  
UCT Computational Biology Division,  
Institute of Infectious Disease and Molecular Medicine,  
University of Cape Town Health Sciences Campus,  
Anzio Road, Observatory,  
7925,  
South Africa.  
Tel: +27 4548784515  
E-mail : anonymous@anonymousworld.ac.za  
Website: [www.h3abionet.org](http://www.h3abionet.org)

### **H3ABioNet Chip data analysis workshop, 23<sup>rd</sup> to 27<sup>th</sup> July 2018, Cape Town, South Africa**

Dear Person X

It is with great pleasure that I cordially invite you to attend the H3ABioNet Chip data analysis workshop to be held in Cape Town, South Africa from the 25<sup>th</sup> to the 26<sup>th</sup> of July 2018 together with the H3ABioNet Annual General Meeting on the 23<sup>rd</sup>, 24<sup>th</sup> and 27<sup>th</sup> of July 2018.

The H3ABioNet Chip data analysis workshop will take place at the Southern Sun Newlands Hotel, 7 Main Road, Newlands, Cape Town, 7700 (<https://www.tsogosun.com/southern-sun-newlands>). H3ABioNet will cover:

1. An economy return air ticket to Cape Town, South Africa.
2. Airport transfers within Cape Town.
3. Accommodation for the duration of the workshop.
4. Breakfast, lunch and dinner meals during the days of the meeting.

Date	Preliminary Agenda Item
23 <sup>rd</sup> July 2018	Lecture
24 <sup>th</sup> July 2018	Lecture
25 <sup>th</sup> July 2018	Practical
26 <sup>th</sup> July 2018	H3ABioNet SAB meeting
27 <sup>th</sup> July 2018	working sessions

We look forward to welcoming you to Cape Town, South Africa.

Yours sincerely,

Professor Person Y.

## Template 12: Airline booking form

- Please complete this form and return to H3ABioNet in order for your airline ticket to attend a workshop / meeting to be issued.
- Please have a copy of your passport present to refer to when filling in this form as any incorrect information provided will be your sole responsibility.
- Please have a scanned copy of your passport information page ready to copy and paste on Page 2 of this document.
- When saving and e-mailing this document to H3ABioNet please add the extension **\_YOUR\_NAME** so we can tell which form belongs to whom.

### 1. Personal / Passport Details

First Name (as it appears on your Passport)	
Last Name (as it appears on your Passport)	
Nationality	
Passport Number	
Date of Issue of your Passport	
Date of Expiry of your Passport	
Place of Issue of your Passport	
E-mail address	
Institution	
PI Name	
Workshop / Meeting Start Date	
Workshop / Meeting End Date	

### 2. Flight Details (From Your City to the City of the Workshop / Meeting– Leg 1)

City of Departure	
Country of Departure	
Date of Departure	
City of Arrival	
Country of Arrival	
Date of Arrival	
Any Special requirements (e.g Halaal, , Kosher, Vegetarian)	

### 3. Flight Details (From the City of the Workshop / Meeting to Your City– Leg 2)

City of Departure	
Country of Departure	
Date of Departure	
City of Arrival	
Country of Arrival	
Date of Arrival	
Any Special requirements (e.g Halaal, Kosher, Vegetarian)	

Please copy and paste a scanned copy of your Passport Information page below:

## Template 13: Airport transfer tracker

<b>Names</b>	<b>Check in</b>	<b>Flight arrival number</b>	<b>Flight arrival time</b>	<b>Check out</b>	<b>Flight departure number</b>	<b>Flight departure time</b>	<b>Arrival Airport transfer cost</b>	<b>Departure Airport transfer cost</b>
<i>William Shakespeare</i>	<i>23-Jul</i>	<i>UA7235</i>	<i>9:40</i>	<i>7/28/18 0:00</i>	<i>UA9587</i>	<i>5:40 PM</i>	<i>\$50</i>	<i>\$46</i>
<i>Madonna</i>	<i>22-Jul</i>	<i>EK778</i>	<i>18:10</i>	<i>28-Jul</i>	<i>EK773</i>	<i>13:05</i>	<i>\$58</i>	<i>\$62</i>

Template 14: Participant/trainer biography

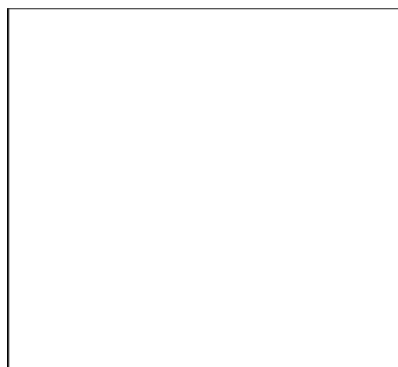
**H3ABioNet biography template**

**First Name:**

**Surname:**

**Email address:**

**Institution:**



Please copy and paste a recent picture of yourself in the box:

Please enter your biography below (max 500 words):

Template 15: Name badge template/example

 H3ABioNet	
<b>Firstname Surname</b>	
<b>Institution</b>	
<b>Country</b>	
<b>Training Event</b>	
<b>Year</b>	
<b>Town/City</b>	
	<b>GOBLET</b>

## Template 16: Pre-training survey

Please take 2 minutes to complete the survey below BEFORE the workshop begins.

Consider it an opportunity to reflect on your current level of confidence with regard to certain skills so that you may compare your confidence pre and post workshop. All submissions are captured anonymously.

### How confident are you in...

	Not at all confident	A little confident	Somewhat confident	Confident	Very confident	Extremely confident
Conducting GWAS tests?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conducting imputation?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Understanding and using various file formats for GWAS?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using the H3ABioNet GWAS workflow?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using the H3ABioNet imputation workflow?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Conducting post-GWAS analysis of GWAS results?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Using the Human Mutation Analysis (HUMA) Database web server?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Presenting GWAS study results	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What are your expectations from this workshop?

---

### Consent:

I consent for all the information that I have given in this survey to be stored securely by H3ABioNet, and for the data to be used for reporting and research purposes only. I acknowledge that any information which can be used to identify me as an individual will remain confidential and will not be made publicly available.

☐ I agree



Please take 10-15 minutes to complete the survey below at the END of the workshop.

[illegible]

## 0% - absolutely extremely unhelpful 100% - useful

41

**4. What did you enjoy most about the workshop?**

**5. What did you least enjoy about the workshop?**

**6. Do you have any suggestions for improving this workshop in the future?**

**7. Would you recommend this workshop to others?**

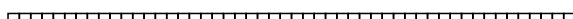
☐ Yes

☐ No

7.1 If no, please tell us why not:

**8. Please rate the overall quality of the workshop:**

0% 50% 100%



(Place a mark on the scale above)

**9. Are there any topics that you would have liked to be included in this workshop that were not?**

☐ Yes ☐ No

9.1. What would you have liked included?

**10. How do you hope to apply what you have learned at this workshop over the next six months?**

**11. Consent:**

I consent for all the information that I have given in this survey to be stored securely by H3ABioNet, and for the data to be used for reporting and research purposes only. I acknowledge that any information which can be used to identify me as an individual will remain confidential and will not be made publicly available.

☐ I agree

# Certificate of Participation

is hereby granted to

Name of attendee

**For attendance to the H3ABioNet H3Africa Genotyping and Genome Wide Association Studies (GWAS) online lectures series and bioinformatics workshop which covered topics from study design, genotype calling, population structure, association testing, imputation, fine mapping and use of the H3ABioNet GWAS workflows.**

**8<sup>th</sup> – 12<sup>th</sup> October 2018**

The H3ABioNet H3Africa Genotyping and Genome Wide Association Studies (GWAS)

bioinformatics workshop was funded by NIH Grant Number: 3236265997

[www.h3abionet.org](http://www.h3abionet.org)

**Professor Nicola Mulder**

**P.I. H3ABioNet**

## Template 19: Bioschema aligned course/workshop template

**Workshop Title/name:**

**Course Overview/description:**

**Keywords:** *Please provide at least 2 – 5 keywords for your training. These should ideally be EDAM terms but general keywords are fine.*

**Skill level of training:** *Please specify whether the training is aimed at a “beginner”, “intermediate” or “advanced” level*

**Language:** *in what language/s is the course and materials offered*

**Credential awarded:** *“None”, “letter of completion”, “accredited certificate”, “workshop certificate”, etc.*

**Has this course been run before?** *Provide links to previous course pages/content if available*

**Type of training:** *“online”, “face-to-face”, “blended”, “other”*

**Venue of workshop:**

**Dates for the workshop (duration if run as a MOOC):**

**Workshop organisers:**

**Link to application form:**

**Workshop Sponsors:** *H3ABioNet and xx*

**Intended Audience:**

**Syllabus and Tools:**

**Licensing for course materials:** *The default licensing attached to any workshop and materials will be a creative commons license. Please do specify if a different license is required or whether materials will not be available publicly. If materials cannot be linked to our website, please specify a contact person in order to gain access to materials in future*

**Prerequisites:**

**Learning objectives/outcomes:** After this workshop participants should be able to:

- 

**Workshop limitations:** This workshop will only provide a foundation for continued learning in

**Workshop Programme:**

Time	Topic	Trainer
27 <sup>th</sup> July 2018		

	Registration and Introductions	
10:30	Tea Break	
11:00		
1:00	Lunch	
2:00		
3:30	Tea Break	
6:00	Workshop End	

\*\* Please note that by completing this template you agree to deposit any training materials used throughout the course in a location specified by the Training Material curation team.

**This template was completed by:** <Name of person who completed/submitted the form>

**This template was checked by:** Name of training taskforce member who checked document before uploading to H3ABioNet website

## Section C: Appendices

### Appendix 1: Developing SMART learning objectives

Source: Rensaleer Institute - office of the Provost (<http://provost.rpi.edu/learning-assessment/learning-outcomes/objectives-vs-outcomes>)

#### What is a learning objective and why to have them?

Learning objectives are statements that describe the expected behaviour participants should be able to demonstrate as a result of the training. These are often used to evaluate the success of the training. Clear learning objectives gives participants a clear idea of what will be taught/learned and what will be expected of them after the session. They also typically form the basis of evaluating a trainer, participant and most importantly, the effectiveness of the course.

Learning objectives should be S.M.A.R.T., that is:

**Specific** – says exactly what the learner will be able to do

**Measurable** – can be observed by the end of the training session

**Attainable** for the participants within scheduled time and specified conditions

**Relevant** to the needs of the participant and the organization

**Time-framed** - achievable by the end of the training session

#### What are the components of Learning Objectives?

Learning objectives can (but do not have to) included 3 main components which are: a) **performance** – which states or describes what the learner should be able to do, b) **conditions** – which may describe the circumstances under which the participant will learn and can include things like tools in the case of bioinformatics training and, c) **criteria** – which defines the required level of performance and may be described in terms of productivity level, time, accuracy, etc.

#### How do I design SMART Learning Objectives?

- **Start with the phrase** “By the end of this session the participant will be able to....” And finish this sentence.
- Add an action verb to each phrase that describes what the participant will be able to do. Some suggested action verbs are the following: assemble, diagram, make, relate, assess, differentiate, measure, repeat, attempt, discriminate, memorize, rephrase, calculate, distinguish, modify, represent.
- Try to avoid difficult or ambiguous terms that are difficult to measure or quantify like “know” or “understand”.
- It is important to remember that objectives must be attainable.

## Easy steps to writing your own objectives

1. Decide what your overarching goal is with this training, for example, should participants be comfortable manipulating and analysing NGS data?
2. Now take some time to list some action words and phrases that would demonstrate to you that this particular goal has been achieved for example:
  - Import data
  - Assess data quality
  - Perform quality control
  - Assemble raw contigs
  - Align forward and reverse sequences
3. Sort out these phrases or words, delete any duplications, etc. for example:
  - Assess the quality of the data - this is a duplication of the phrase below and so you may want to remove it.
  - Perform quality control
  - Assemble raw contigs - this is also a duplication of the phrase below so you may want to choose which you prefer
  - Align forward and reverse sequences
4. Here you will now formulate complete statements for each phrase where you should also describe the quality, nature or amount you will consider acceptable. These will form your learning objectives. For example (based on previous phrases):
  - Import raw data reads from a shared server
  - Assemble raw contigs by choosing an appropriate assembler
  - Perform an assessment of the data quality
5. It is important that your objectives are measurable so try to test the above statements with the question: "If someone achieved or demonstrated each of these performance areas, would I be willing to say they have achieved the objective?" The goal of the learning objective could then be considered the learning outcome.

## Examples of Learning Outcomes based on the statements above

1. Students will know how to access a shared server and move data to their home directories



2. Student will be able to perform a quality assessment of raw reads
3. Students will be able to assemble contigs using raw sequence data
4. Students are able to evaluate outputs of various assemblers and know the describe the useful metrics

### Writing learning objectives using Bloom's taxonomy

"Bloom's taxonomy is a set of three hierarchical models used to classify educational learning objectives into levels of complexity and specificity" (<https://www.teachthought.com/learning/what-is-blooms-taxonomy-a-definition-for-teachers/>)

Six levels of bloom's taxonomy have been defined and are listed here:

1. Level 1 is to Remember.
2. Level 2 is to Understand.
3. Level 3 is to Apply.
4. Level 4 is to Analyze.
5. Level 5 is to Evaluate.
6. Level 6 is to Create.

(Adapted from work by LeBrun and Johnstone (1994:162). See the UKCLE guidance note [Ensuring successful assessment](#) for additional examples of how to achieve learning objectives in the context of law.)

If you want your Students To...	Use One or More of These Verbs	Add the Object	And Condition/Context
<b>Know</b>	state, define, name, write, recall, recognize, list, label, reproduce, identify	knowledge of specifics, for example research, theory, examples of case law, method, approach	criminal law, tort, family law, human rights, 19th century medical law
<b>Comprehend</b>	appreciate, select, indicate, illustrate, represent, formulate, explain, classify, comprehend	translate, interpret, extrapolate	
<b>Apply</b>	predict, demonstrate, instruct, compute, use, perform, implement, employ, solve	apply knowledge, understanding to	
<b>Analyze</b>	analyze, identify, differentiate, dissect, compare, contrast, examine, interpret, investigate	analyze relationships, elements, organizational principles	

<b>Synthesize</b>	combine, summaries, restate, précis, argue, discuss, organize, derive, relate, generalize, integrate, conclude	produce a new form, plan, set of ideas, set of relations	
<b>Evaluate</b>	judge, justify, evaluate, determine, support, defend, attach, criticize, appraise, weigh up, assess	judge in terms of internal and external evidence	

You are now in a position to begin writing your own learning objectives.

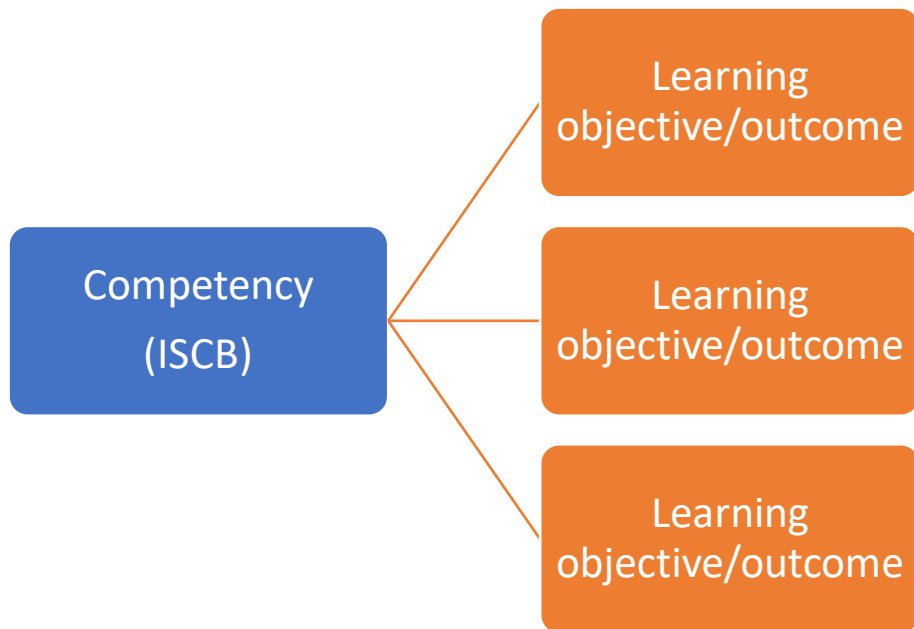
## Appendix 2: Developing competencies – quick guide

### Competencies vs. Learning Objectives/Outcomes

Competencies and learning objectives are often thought to be the same, however, there are significant differences between the two.

Competencies are what an individual needs to be able to do in order to successfully perform a particular function or task. Learning objectives are what the individual will be able to demonstrate during the learning session/s to confirm they will be able to meet those competencies.

Competencies thus typically refer to **bundles** of the essential knowledge, skills, and abilities (KSAs) required to achieve an acceptable level of performance, while learning objectives are typically tailored toward a specific course and its objectives. A learning objective should describe exactly what a participant will be able to do in a measurable way after completion of a training course/workshop. By accomplishing a set of objectives, the individual develops the necessary competencies.



### In the case of H3ABioNet:

- **Competencies** – are used when designing a degree program or course where assessments are administered regularly to determine if a particular skill-set is being developed at an acceptable level.
- **Outcomes/Objectives** – are used for workshops where assessments may not typically be performed but participants are able to demonstrate what they have learned.

## Connecting Competencies and Learning Objectives

In this context, learning objectives can be thought of as the steps on the way to attaining a competency.

Thus, when using competencies to design your training, it is customary to work backwards from the desired competency to the mode of instruction. In order to determine which competencies are needed by a particular participant, a needs analysis should first be performed to determine what an individual needs to be able to do in order to perform tasks at a specific level. This will typically result in a list of competencies.

**Desired competencies are then broken down into their basic parts by determining what the participant would need to know to perform this competency at a specific level.** Those parts would be the learning objectives/outcomes. Typically, there is more than one learning objective defined for a given competency.

### *Example of Competencies and Learning Objectives*

Competency:

- Effectively use a microscope to examine a slide

Learning objectives related to the above competency:

By the end of this course, the participant will be able to;

- Prepare a microscope slide
- Name and define the various components of a microscope
- Know how to properly mount a slide on a stage and adjust magnification
- Analyse the contents of a provided slide

## ISCB Core Competencies

The International Society for Computational Biology has developed a set of core competencies suggested for the field of bioinformatics. A description of each competency is provided by the ISCB along with a specific set of knowledge, skills and attitudes that demonstrate a certain level of proficiency in a particular competency. (see full article here: <https://journals.plos.org/ploscompbiol/article?id=10.1371/journal.pcbi.1005772>)

**Table 1. Bioinformatics core competencies.** This table provides the current competency list following a process of community engagement.

Label	Competency
A	General biology
B	Depth in at least one area of biology (e.g., evolutionary biology, genetics, molecular biology, biochemistry, anatomy, physiology).
C	Biological data generation technologies.

D	Details of the scientific discovery process and of the role of bioinformatics in it.
E	Statistical research methods in the context of molecular biology, genomics, medical, and population genetics research.
F	Bioinformatics tools and their usage.
G	The ability of a computer-based system, process, algorithm, component, or program to meet desired needs in scientific environments/problem.
H	Computing requirements appropriate to solve a given scientific problem (e.g., system, process, algorithm, component or program; define algorithmic time and space complexities and hardware resources required to solve a problem).
I	GUI/Web-based computing skills appropriate to the discipline (e.g., effectively use bioinformatics and analysis tools through web).
J	Command line and scripting based computing skills appropriate to the discipline.
K	Construction of software systems of varying complexity based on design and development principles.
L	Local and global impact of bioinformatics and genomics on individuals, organizations, and society.
M	Professional, ethical, legal, security, and social issues, and responsibilities of bioinformatics and genomic data in the workplace.
N	Effective communication of bioinformatics and genomics problem/issue/topics with a range of audiences, including, but not limited to, other bioinformatics professionals.
O	Effective teamwork to accomplish a common scientific goal.
P	Engage in continuing professional development in bioinformatics.

Each of the above competencies have been designed to easily map to *Bloom's Taxonomy* which classifies learning objectives into 6 hierarchical (cognitive) levels ranging from knowledge to evaluation, where knowledge refers to the lowest cognitive level and evaluation refers to the highest cognitive level. Each competency can thus be gained at various levels of the bloom's taxonomy. Table 2 outlines the definitions of each bloom's level and lists some verbs that may be used to identify the bloom's level based on a set of learning outcomes for training.

**Table 2. Bloom’s Revised Taxonomy. The table provides, for each term, illustrative examples of skills demonstrating the given level of competency and a general definition.**

Cognitive Level	Illustrative Verbs	Definitions
Knowledge	arrange, define, describe, duplicate, identify, label, list, match, memorize, name, order, outline, recognize, relate, recall, repeat, reproduce, select, state	remembering previously learned information
Comprehension	classify, convert, defend, discuss, distinguish, estimate, explain, express, extend, generalize, give example(s), identify, indicate, infer, locate, paraphrase, predict, recognize, rewrite, report, restate, review, select, summarize, translate	grasping the meaning of information
Application	apply, change, choose, compute, demonstrate, discover, dramatize, employ, illustrate, interpret, manipulate, modify, operate, practice, predict, prepare, produce, relate, schedule, show, sketch, solve, use, write	applying knowledge to actual situations
Analysis	analyze, appraise, breakdown, calculate, categorize, classify, compare, contrast, criticize, derive, diagram, differentiate, discriminate, distinguish, examine, experiment, identify, illustrate, infer, interpret, model, outline, point out, question, relate, select, separate, subdivide, test	breaking down objects or ideas into simpler parts and seeing how the parts relate and are organized
Synthesis	arrange, assemble, categorize, collect, combine, comply, compose, construct, create, design, develop, devise, explain, formulate, generate, plan, prepare, propose, rearrange, reconstruct, relate, reorganize, revise, rewrite, set up, summarize, synthesize, tell, write	rearranging component ideas into a new whole
Evaluation	appraise, argue, assess, attach, choose, compare, conclude, contrast, defend, describe, discriminate, estimate, evaluate, explain, judge, justify, interpret, relate, predict, rate, select, summarize, support, value	making judgments based on internal evidence or external criteria

The ISCB also developed a set of typical personas within the bioinformatics field along with suggested competencies needed by each of these personas and their suggested level of bloom’s taxonomy. There are three main personas i.e. “Bioinformatics User”, “Bioinformatics Scientist” and “Bioinformatics Engineer”, each with an associated list of competencies. This is intended to guide course developers and ensure they target competencies relevant to their specific needs and audience at a level acceptable for that persona. A few examples of personas of bioinformatics users are listed in Table 3 along with their list of suggested competencies, mapped to bloom’s taxonomy.

**Table 3. Mapping of competencies to Bioinformatics user personas via Bloom's Taxonomy.**

Competency \ Persona	Physician	Lab technician	Ethicist	Biocurator
A. General biology	knowledge to application	comprehension	knowledge	comprehension
B. Depth in at least one area of biology (e.g., evolutionary biology, genetics, molecular biology, biochemistry, anatomy, physiology)	application	application to evaluation	evaluation	application to evaluation
C. Biological data generation technologies.	knowledge	knowledge to evaluation	knowledge	knowledge
D. Details of the scientific discovery process and of the role of bioinformatics in it.	application to analysis	comprehension to analysis	knowledge to comprehension	comprehension to evaluation
E. Statistical research methods in the context of molecular biology, genomics, medical, and population genetics research.	knowledge to application	knowledge to application	knowledge to comprehension	comprehension
F. Bioinformatics tools and their usage.	comprehension	knowledge to analysis	knowledge	application
G. The ability of a computer-based system, process, algorithm, component, or program to meet desired needs in scientific environments/problem.	N/A	knowledge	N/A	comprehension to application
H. Computing requirements appropriate to solve a given scientific problem (e.g., system, process, algorithm, component or program; define algorithmic time and space	N/A	knowledge	N/A	comprehension to application

complexities and hardware resources required to solve a problem).				
I. GUI/Web-based computing skills appropriate to the discipline (e.g., effectively use bioinformatics and analysis tools through web).	knowledge	application	comprehension	application to evaluation
J. Command line and scripting-based computing skills appropriate to the discipline.	N/A	knowledge	N/A	comprehension
K. Construction of software systems of varying complexity based on design and development principles.	N/A	N/A	N/A	knowledge
L. Local and global impact of bioinformatics and genomics on individuals, organizations, and society.	knowledge	comprehension	application	comprehension
M. Professional, ethical, legal, security and social issues and responsibilities of bioinformatics and genomic data in the workplace.	application	evaluation	evaluation	analysis
N. Effective communication of bioinformatics and genomics problem/issue/topics with a range of audiences, including, but not limited to, other bioinformatics professionals	comprehension	application	application	application to evaluation
O. Effective teamwork to accomplish a common scientific goal.	knowledge	analysis	knowledge	analysis
P. Engage in continuing professional development in bioinformatics.	evaluation to analysis	application	application to evaluation	application

### Real example:

H3ABioNet recently developed a 16S rRNA microbiome data analyses course which contained a series of modules, one of which was an “introduction to the Unix shell and R” module. Below we take you through some of the initial steps in mapping competencies for this topic.



STEP ONE: The competencies for the module were decided on, based on a chosen persona. The persona here is simply a “bioinformatics scientist”

STEP TWO: trainers/content developers brainstorm some competencies:

- E: Statistical research methods in the context of molecular biology, genomics, medical, and population genetics research.
- G: The ability of a computer-based system, process, algorithm, component, or program to meet desired needs in scientific environments/problem.
- J: Command line and scripting based computing skills appropriate to the discipline.

STEP THREE: Decide which are relevant to your persona and the course - you can also include the bloom’s taxonomy for each competency here:

- E: Knowledge – perhaps not as relevant
- G: Knowledge - perhaps not as relevant
- J: Knowledge – key competency here

STEP FOUR: How do we achieve that level of competency. Here we can begin to look at which learning outcomes will help us achieve this competency at the level of “knowledge” as indicated above:

**Learning outcomes (agreed on by expert trainers):**

Module 1: Introduction to Unix shell and R

## **Unix**

By the end of this course, students should be able to:

1. Comfortably operate within the Unix Shell and command-line environment
2. Identify and appropriately obtain, install, utilize and troubleshoot command-line utilities
3. Develop analytical pipelines and workflows using Shell scripting
4. Process data sets in a pipeline of linked steps and checking results using a visualization tool

## **R**

By the end of this course, students should be able to:

1. Demonstrate understanding of the basic concepts in R and Install relevant R packages.
2. Demonstrate knowledge of syntax, data types and programming in R.
3. Perform statistical analysis of biomedical datasets using various packages in R and Bioconductor.
4. Evaluate the performance of different packages available for the same kind of analysis.

You may then proceed to other modules or topics covered by your course and repeat these steps (as needed) until you have a final set of competencies for your course.