Train the Trainer

GOBLET training best practices workshop

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www.ebi.ac.uk/training

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Aim of course

To provide new trainers with guidance and best practice tips for developing and delivering training in bioinformatics, exploring a range of methods appropriate to different learning styles and sourcing appropriate training material.

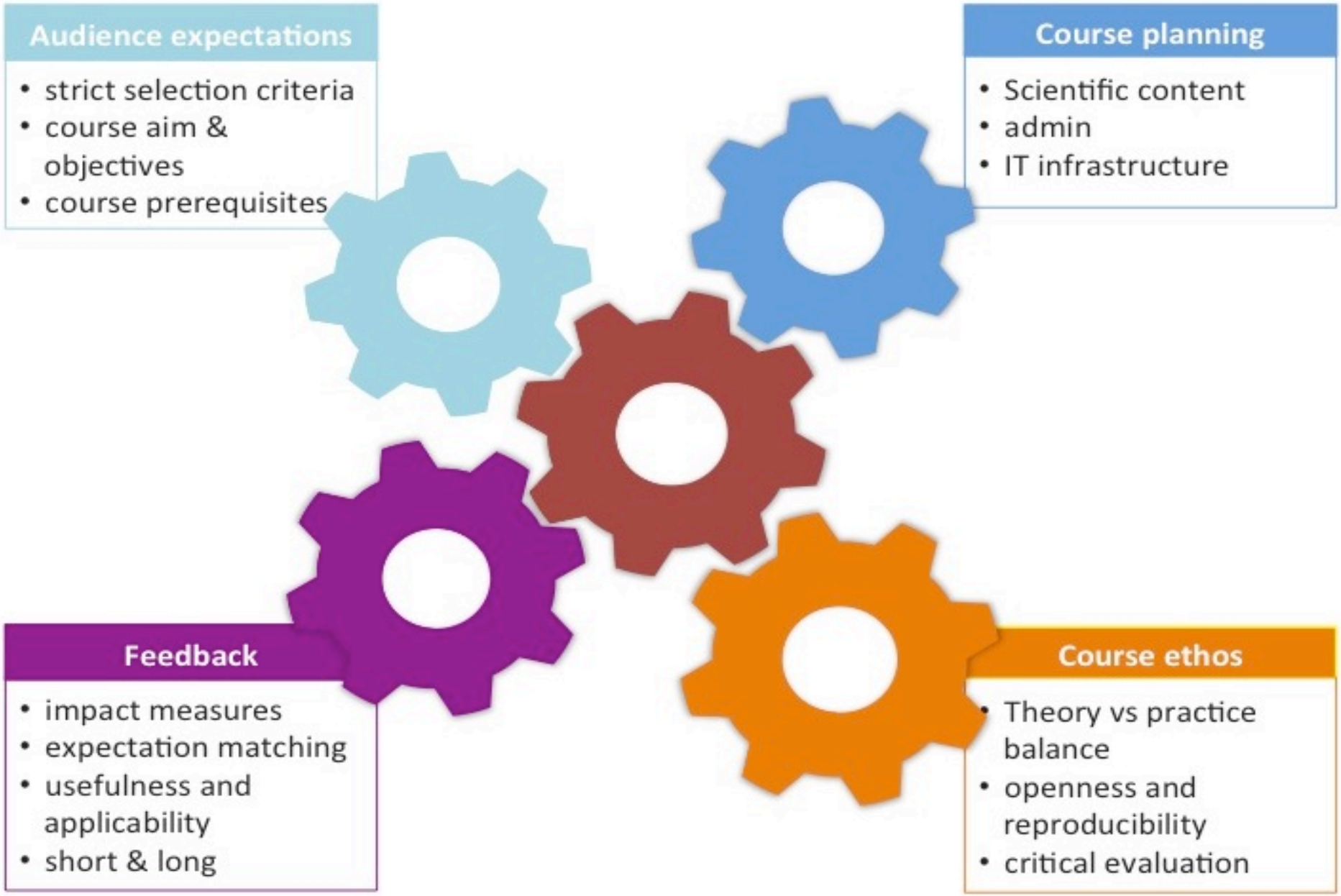
Learning Objectives

- The workshop will aim to:
  - provide guidance on general training techniques and appropriate use of methods based on learner needs, including some general do's and do not's for successful training.
  - provide a framework for successful session / curriculum design and further development, to enable trainers to build training appropriate to their learner's needs.

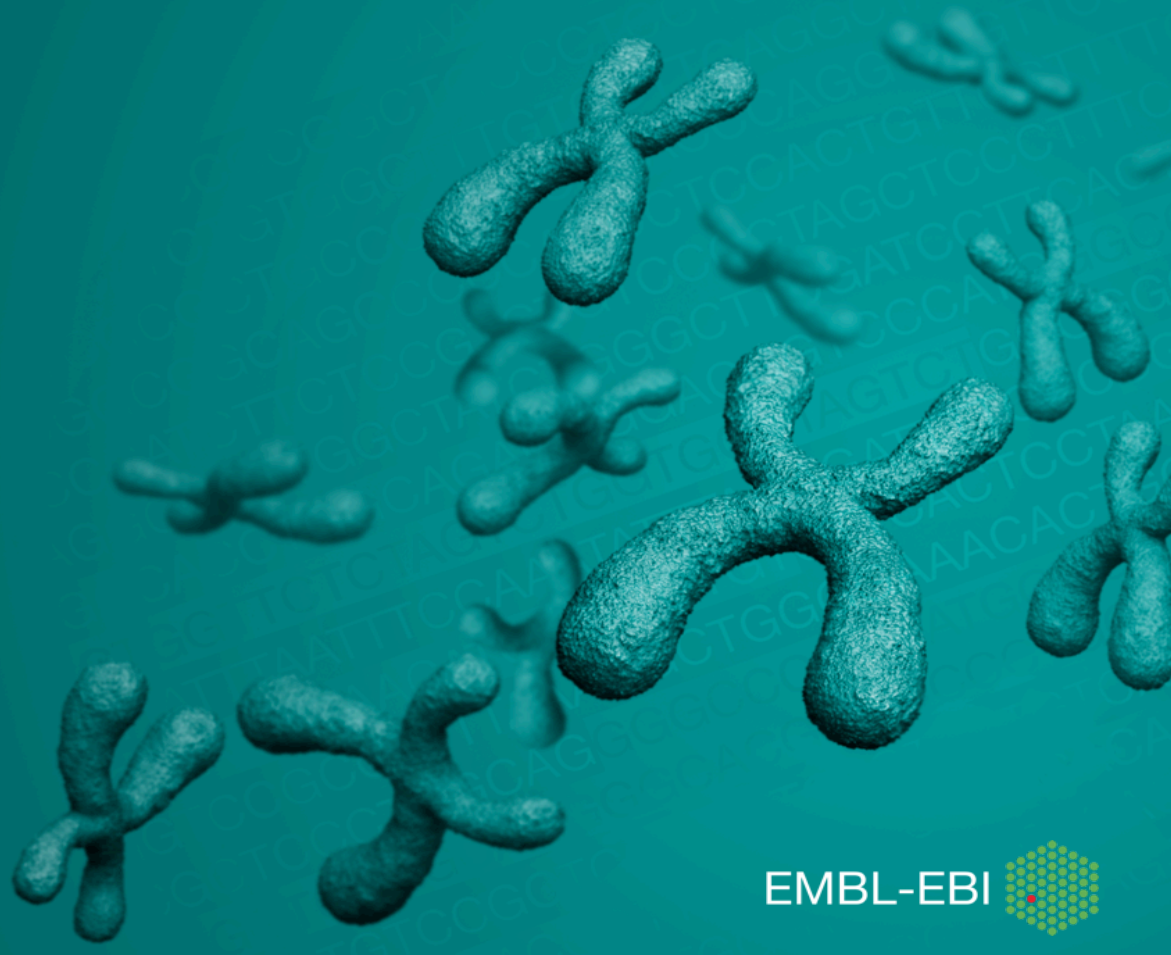
Overview

1. What makes good and bad training?
2. How people learn – learning styles
3. Catering for different learning styles
4. Session / course planning - writing aims and learning outcomes
5. Finding materials and annotating your materials for re-use
6. Feedback - how to get it, what to do with it
7. Summary

Bioinformatics course's core elements



Session 1 : General training thoughts and tips



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Training you have had….

- What makes a good training session ?

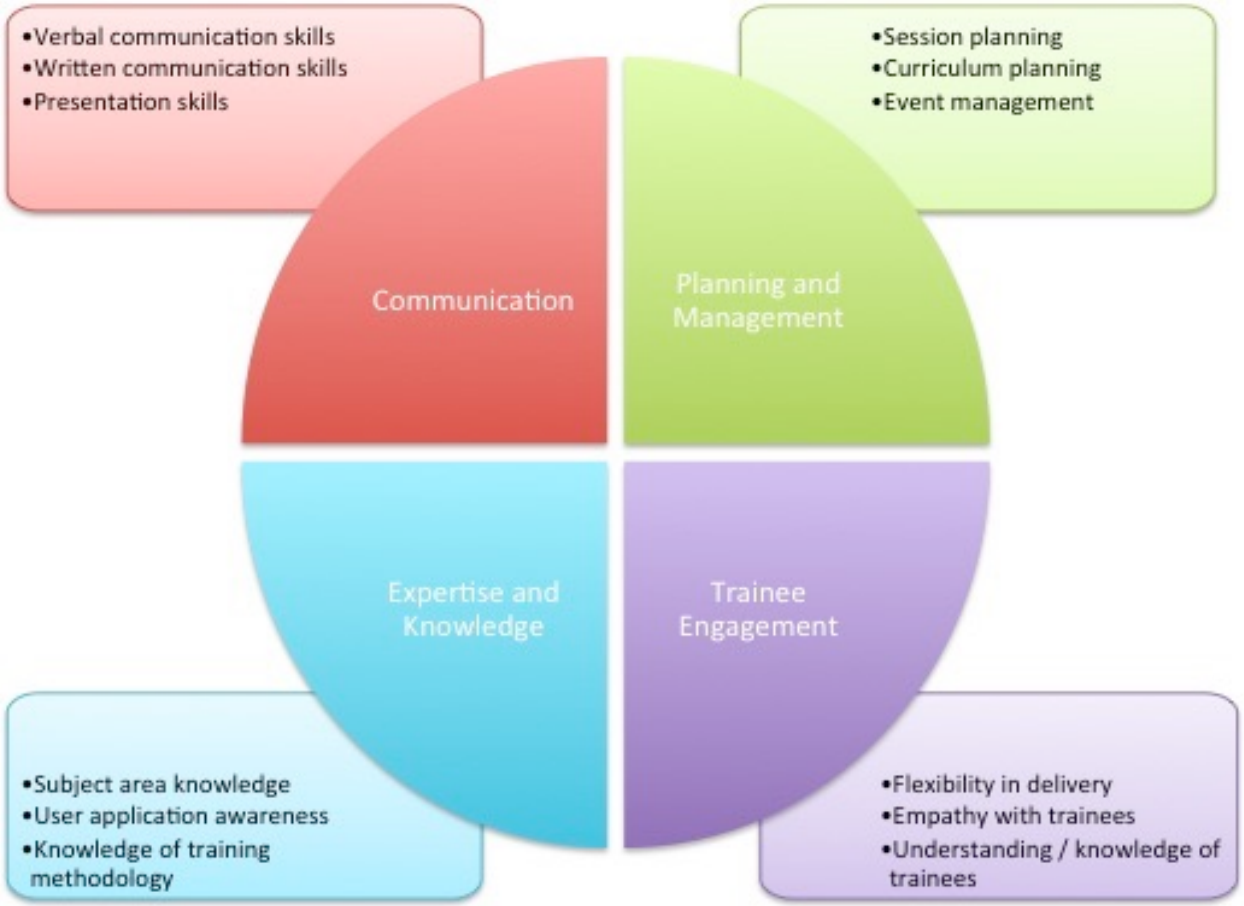
- What makes a bad training session ?

    - Think of an example of each that you have participated in and list your thoughts…

What makes a good trainer ?

- Knowledge of subject
- Clear aims for session outcomes
- Confidence in delivery
- Appropriate delivery
- Listens to trainees
- Flexible – can change pace / depth if required
- Approachable
- Engaging

Goblet TTT matrix

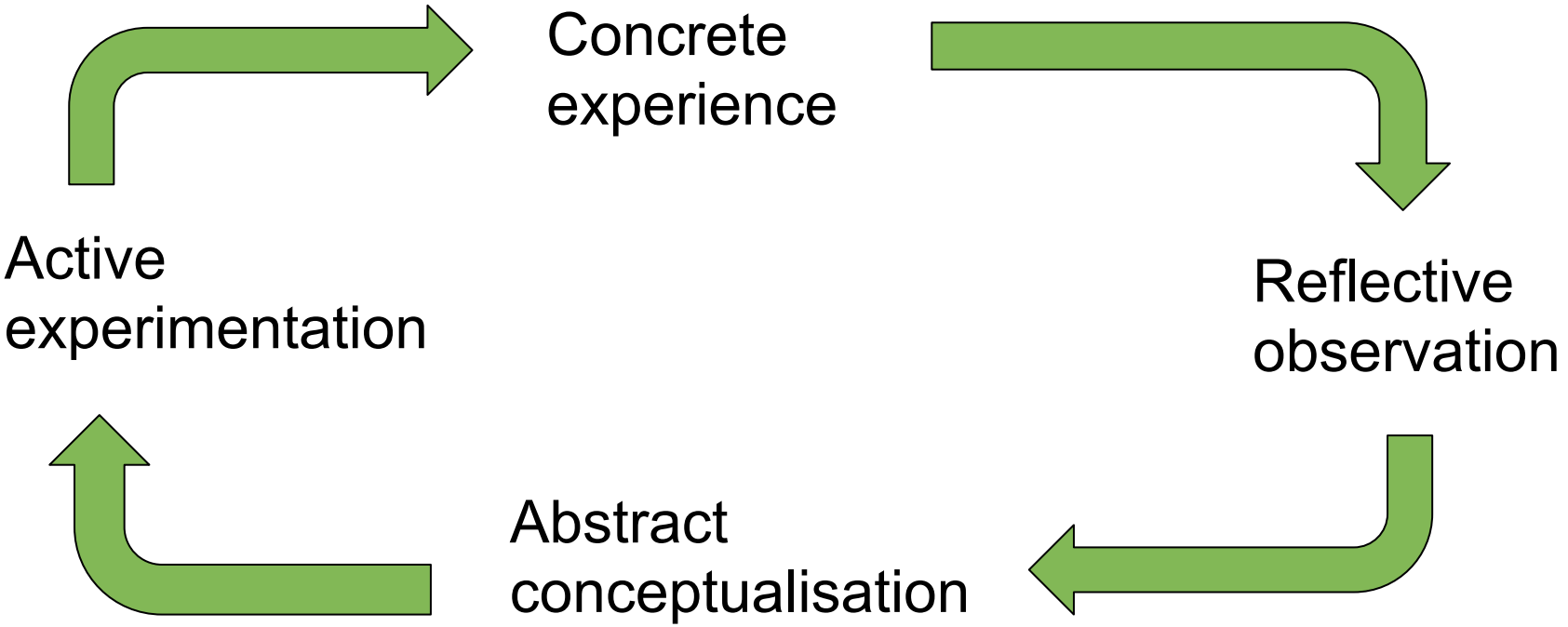


How do people learn ?

- How do you go about learning something new ?
  - Read about it
  - Attend a training session !
  - Have a go ?
    - Do, reflect, process, further understand ?

Experiential learning: Kolb's cycle

Kolb learning cycle :



Kolb's cycle in detail

- Concrete experience – be involved in a new experience
- Reflective observation – reflect on your experiences, potentially with feedback from others
- Abstract conceptualisation – form and reform your ideas, integrate into theory
- Active experimentation – make decisions and problem solve

Individual learning styles

- Different people will have different ways of learning
  - How do you think you learn?
  - Complete a learning styles questionnaire

Learning styles relating to Kolb

- Honey and Mumford, 1982
- Four main categories of learning style
  - Activist – challenges, new experiences and problems, excitement and freedom
  - Pragmatist – Practically based, immediately relevant learning activities, scope for practice and using theory
  - Reflector – structured learning activities with time to observe, reflect and think
  - Theorist – logical, rational structure and clear aims – time for methodical exploration

How to apply these ?

- No chance of running a questionnaire at the beginning!
  - Must consider that you will have a mix of styles in your group, so need to provide learning materials / activities that will apply to all
  - What types of learning activity can you think of?
  - Which learning activity for which style?

What activities different styles relate to

Activist	Brainstorming, problem solving, group discussion, puzzles, competitions, role-play
Theorist	Models, statistics, stories, quotes, background information, applying theories
Reflector	Paired discussions, self analysis questionnaires, personality questionnaires, time out, observing activities, feedback from others, coaching, interviews
Pragmatist	Time to think about how to apply learning in reality, case studies, problem solving, discussion

Learning activities

- Main thing to remember:
  - People can only concentrate for short periods – often 15 – 20 minutes at most, before it drops
    - For lecture sessions – intersperse with activities eg questions, short problems, discussion points
    - For practical sessions – check on where the group as a whole is, or have demonstrators who can move around the room

Most people learn……

- 10% of what they read
- 20% of what they hear
- 30% of what they see
- 50% of what they see and hear
- 70% of what they talk over with others
- 80% of what they use and do in real life
- 95% of what they teach someone else

Whilst running a session

- Do keep an eye on your “audience”
  - Watch for signs that they don’t understand, or concentration is lapsing

- Be prepared for questions – but if you don’t know, don’t panic !
- Try and be flexible – adapting your session to suit the group as you go if possible
- Practicals – can be useful to have someone at the back of the room !

Thinking of training sessions you currently run, how effective do you think they might be at meeting the needs of a range of learning styles?

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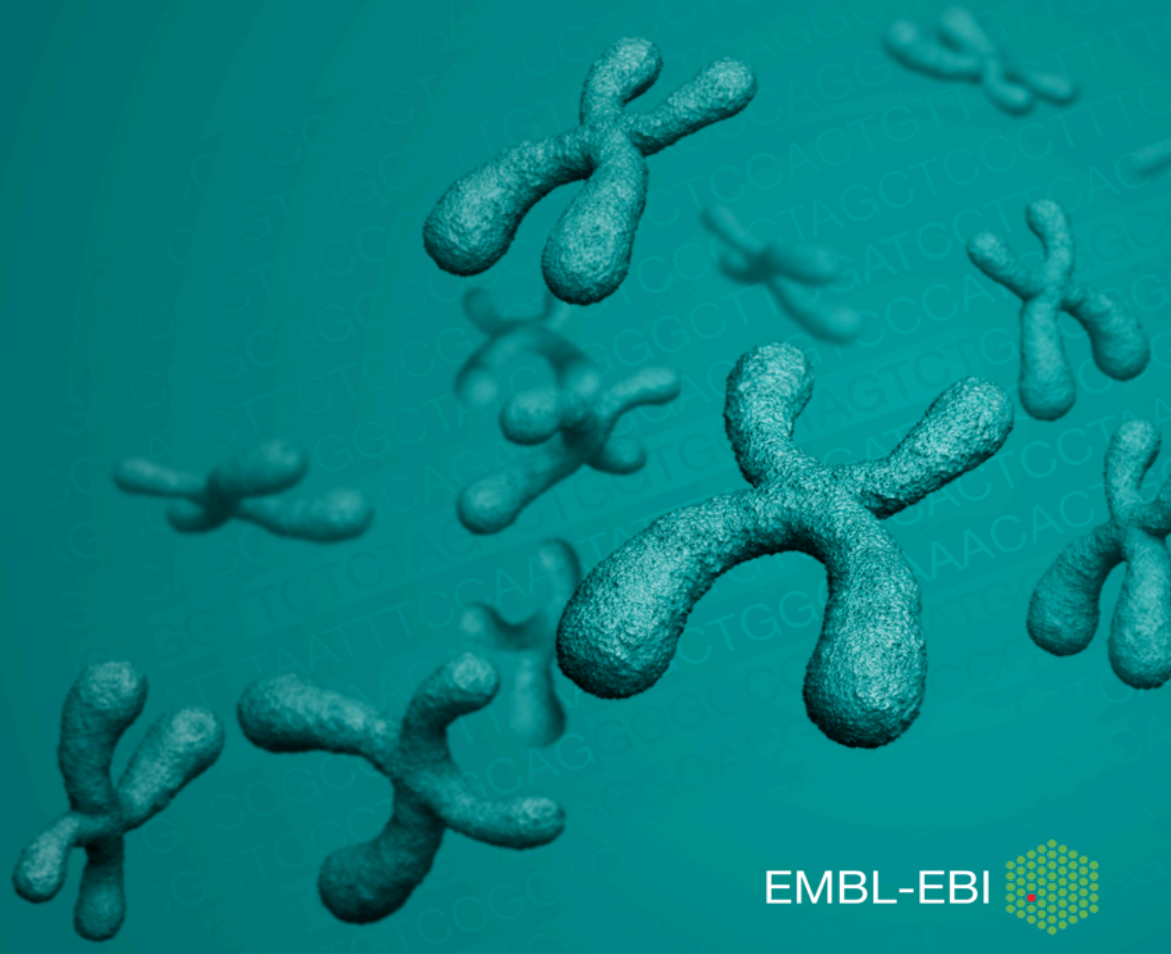
Course design considerations



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Course design

- Where to start ?
  - You need to determine
    - Course audience
    - Course aim

Course audience

- This may or may not be your choice !
- Consider what background knowledge the trainees may have, what they are currently doing, how much time they may have to spare
- At this point may want to start to think about pre-requisite knowledge
  - Eg Undergraduate level biology

What challenges do we face?

Diversified audience

- different backgrounds (biologists, bioinformaticians, clinical researchers, etc.)
- different levels of statistical knowledge
- different levels of familiarity with programming languages

I am starting a project involving HTS applications and I need to learn how to analyse the data that I will generate. I have never done this kind of analysis before, and I have very little familiarity with data analysis tools. Bioinformatics support is lacking in our department, so it is vital for me to acquire these skills if I want my project to be successful.

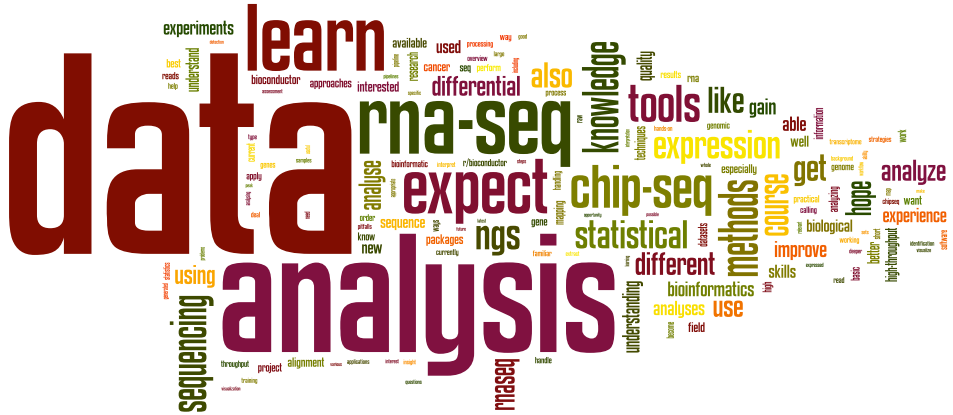
I am involved in HTS projects. The analysis is done by a bioinformatician, but I would like to learn more about the analysis to be able to have a better interaction with the bioinformatician. I have run some simple analysis tasks using pre-compiled scripts, but I would not know how to modify them to suit my needs.

I am a bioinformatician, supporting various research groups with their analysis needs. I run HTS data analysis using some tools, but I want to learn how to use other tools as well as keep up to date with the latest algorithms that are being developed in this field.

I have been involved in microarray data analysis projects for a long time and now I am switching to HTS data analysis. I feel confident with using tools for microarray analysis, but I want to know what I need to use to analyse HTS data. I am confident in the use of some programming languages.

What challenges do we face?

- Participants' expectations



- Break down the complexity of the analytical pipelines
- What software to use? command line vs. workflow based solutions, e.g. Bioconductor vs Galaxy
- Computing infrastructure for training purposes often inadequate

What are we aiming for?

- What is the realistic outcome of a course?
- Trainees should learn:
  - ✓ how to interpret HTS data
  - ✓ what the HTS data analysis entails and how the data processing influences the interpretation?
  - ✓ how to critically evaluate the data analysis tools available
- Enable life scientists to establish a partnership with their statistician and/or bioinformatician collaborators, based on mutual understanding

Course aim

- What is it that you are trying to provide through this course? What subject matter is to be covered
- High level detail – overall course “mission”
  - May be to teach people a particular analytical method, or to introduce people to a new resource.
  - Clear aim will help when setting curriculum in more detail.
- Leads into Learning Outcomes
  - What do you want your trainees to do at the end?

Learning outcomes

- Should be **SMART**
  - **S**pecific — What ?
  - **M**easurable — By trainee / trainer or both ?
  - **A**chievable — Is it possible in this context ?
  - **R**ealistic — Can we really train them to do this ?
  - **T**ime-limited — In what time ?

Levels of learning – Blooms taxonomy

1 Knowledge

2 Comprehension

3 Application

4 Analysis

5 Evaluation

6 Synthesis

From taxonomy to verbs…

Knowledge	Define, repeat, record, list, recall, name, relate, underline
Comprehension	Translate, restate, discuss, describe, recognise, explain, express, identify, locate, report, review, tell
Application	Interpret, apply, employ, use, demonstrate, dramatise, practice, illustrate, operate, schedule, sketch
Analysis	Distinguish, analyse, differentiate, experiment, test, compare, contrast, criticise, diagram, inspect, debate, question, relate, solve, examine, categorise, appraise, calculate
Synthesis	Compose, plan, propose, design, formulate, arrange, assemble, collect, construct, create, set up, organise, manage prepare
Evaluation	Judge, appraise, evaluate, rate, revise, assess, estimate

Course descriptors

- Keep course descriptors concise, but consider what information people will use to choose a course.
  - List points to include?
- Make sure it is a true representation of what you will cover, so trainee expectations can be managed / met
- Advertise everywhere you can!

How comfortable would you feel if asked to specify course audience / aims / outcomes etc for a course on a topic that you know about?

(0-5)

Applications

- Methods of application can vary – e.g. CV and supporting letters or completion of online form

- You need to decide on your selection criteria
  - Be transparent, so if someone queries you, they can be answered.
  - Make sure that you can get the information you need for selection from the information you have requested.

- May decide on a selection committee - more than one person to review all applicants.

Participants' selection criteria

- Selection criteria are fundamental
- For NGS courses we require:

  - ✓A basic knowledge of the programming languages that will be used during the course (e.g. R, Unix)
  - ✓Participants to have (or will shortly to acquire) data ready to analyze
  - ✓Having the possibility to immediately apply what they have learned during the course to the analysis of their own data is the most effective approach.

Curriculum planning

- No one set way of doing this – but if LO's are set, then expand from these
  - What are the major themes which can be identified under your major course topic?
  - Which of these will you cover (an you cover all?)
  - Need to consider depth of learning
  - Think about balance of practice and theory

Planning the course

- Scientific and “social” elements
  - Scientific – in what order will you deliver the various elements of the course content
  - Social – coffee and lunch breaks, opportunities for networking
- How long do you have to deliver the course ?
  - How long should your day be ?
- Theory vs practice
  - Even in a very practical course, theoretical explanation session are helpful for scene setting

Commonly used sessions

- Course welcome and introduction
  - Welcome your trainees, give any H+S details etc
  - Intro to course, aims and expectations

- Start of day
  - Brief intro of what is to come, can check everyone is in, all happy
- End of day
  - Quick recap, again check everyone is ok, good time for discussion

- Final wrap-up session and feedback collection

Sources of training material

- Do you start with a blank page or do you seek out other's training materials?
  - Where to find?
    - GOBLET
    - TeSS training platform
    - GitHub
    - Train online
    - Software and data carpentry
    - Research groups / resource developers

How re-usable are they?

- What needs to be considered to share materials effectively?
  - Consistent description / annotation
  - Open access (Creative commons)
  - Community led

Collection of feedback

- Feedback from trainees can be very useful
  - Keep surveys short
  - Think about your reasons for collecting the information and what you need to collect
  - Mixture of closed and open questions
  - Think about who will have access to the results – do you need to moderate?

- You should always review your feedback along with your own reflections

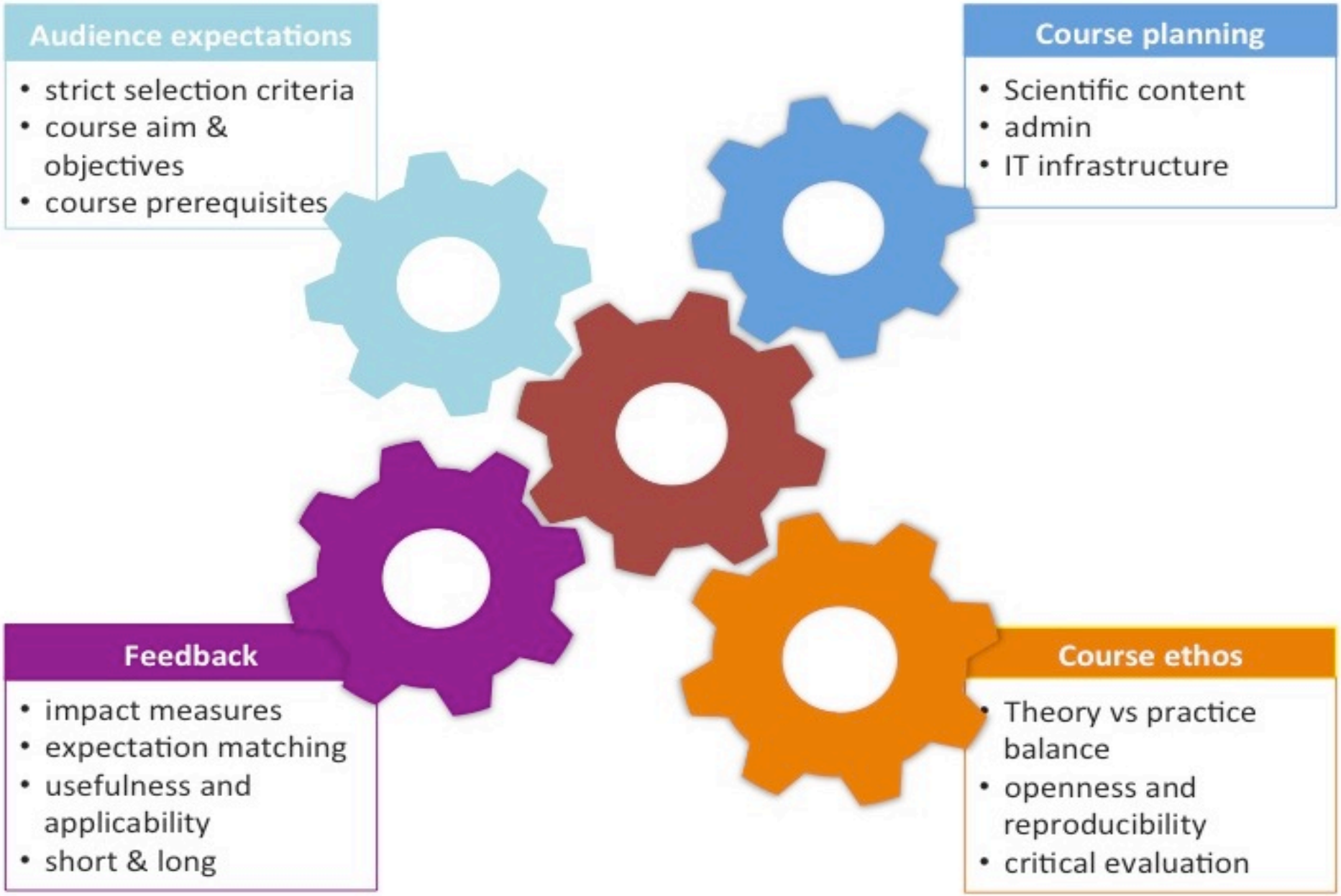
Reflective practice

- After you have completed a session
  - Think about what worked well and what you were not happy with
  - Helps you when planning future sessions, whether the same or a different one
  - Don’t be too negative – remember groups vary (do think about the environment etc)
  - Where does you feedback come from?
    - Self, the room, colleagues and end of course survey

Long term feedback

- Were you working in the field of microarray or HTS data analysis BEFORE attending this course? Were you working in the field of microarray or HTS data analysis AFTER attending this course?
- Did you establish collaborations with other participants that attended the same course?
- Did you write a thesis following your participation to this course?
- Did you publish any journal article/book chapter as a result of your participation to this course?
- Did you write a grant proposal as a result of your participation to this course?
- Have you authored any software as a result of your participation to this course?

Bioinformatics course's core elements



Please rate your satisfaction with the dinner that you had yesterday?

0-5

Lecture – style sessions

- Death by powerpoint is common !
  - Try to make slides more interesting if possible
  - Don’t necessarily put everything on the slide you are going to say – avoids you reading off your slides!
  - Don’t overfill your slides and use at least a 20 point font
  - Build time in for questions, discussions…..

Practical sessions

- Practical handbooks important – guided exercises to follow
  - Can start with a demonstration, then into the guided exercise
  - Remember not everyone will necessarily go at the same pace
    - Extra time in programme for people to finish if they wish– eg lunchtimes
    - Have some extra exercises eg problems to solve, for those who finish
- Can be difficult deciding how much time to give
- Having extra demonstrators in the room to answer queries is very helpful

Group problem solving

- Can be a good way of getting people talking, can also be a useful way of ascertaining how much people know
  - Eg Workflow exercise – what are the steps taken in a metagenomic workflow, potential limiting points in this etc
  - At the beginning can be useful to get people into the mindset, and help you set the scene for the course
  - You can refer back to this session at different points in the course, helping reinforce ideas
- Especially useful in sessions where you have a high number of novices in the field