Enclosure 2: Mandatory training in experimental design and statistical analysis provided by the School of Biological Sciences

The School of Biological Sciences does not provide mandatory training across the School as a whole, but some of the Doctoral Training Programmes do provide mandatory training in experimental design and statistical analysis, and the training is listed below by DTP. Apart from the MRC DTP in Precision Medicine, Biological Sciences students are registered at the University on one of our 6 PhD programmes depending on which institute they are affiliated to rather than a programme specific to their funding body.

BBSRC funded EASTBIO Doctoral Training Programme

Quantitative and Computational Skills masterclasses – each conferring 10 training points as a requirement for EASTBIO students:

Statistics and Experimental Design

- Basic concepts of statistics, summaries, standard error, p-values, confidence intervals and considerations in the design of experimental and observational studies, including sample size.
- Explaining study outcomes: the linear model, analysis of variance, confounding and adjustment. Recognising repeated measures and mixed models.

Introduction to Matlab

- Basics, Math & Variables
- Logical Operators, Scripts, Functions and Flow Control
- Statistics and Plotting

Artificial Intelligence and Machine Learning for Bioscientists

- Introduction to Machine Learning
- Focus on specific (statistical) machine learning methods
- Introduction to scRNA-seq and spatial transcriptomics
- Programming Activities in R

Wellcome Trust funded programme in Hosts, Pathogens and Global Health

Short introduction to statistics course (3 sessions), followed by a more detailed introduction to R course comprising of the following 7 sessions:

- Getting started in R
- Plotting data in R
- Introduction to Generalised Linear Models
- Advanced Generalised Linear Models
- Binomial and Poisson Generalised Linear Models
- Mixed Models
- Practical Problem Solving

Later in the year, topics covered are designing scientific questions, statistical sampling methods, basic experimental design for biologists, database design, and statistical analysis (choosing an appropriate statistical method, hypothesis testing, challenges in data analysis).

Wellcome Trust funded programme in Integrated Cell Mechanisms

The Introduction to Statistics workshop is run during induction week and is mandatory for all students. The course covers:

- Basic probability
- Probability distributions
- Descriptive analytics (summary statistics, boxplots etc)
- Inferential statistics and hypothesis testing (population sampling, parametric and non-parametric tests, p-values, multiple testing)
- Experimental design (power calculations, replicate experiments)

This is followed up with a practical, which teaches programming, plotting and performing statistical tests in R.

MRC Precision Medicine Doctoral Training Programme:

During our introductory week which is mandatory, there is a session on Experimental Design/Research Integrity. We also have had an external provider for Research Integrity courses. Again, during mandatory Induction, we have a systematic review session which broaches methodological and statistical approaches, and we also discuss IAD courses with them, of which numerous are statistical.

Finally, as it is an integrated PhD, we have 3 areas that they are required to pick taught courses from, one area is quantitative/ data skills and includes many statistical based courses: Introductory probability and statistics, Introduction to Bioinformatics, Medical informatics and Data Analysis, Introductory applied machine learning, and Quantitative genetics.

NERC E4 Doctoral Training Programme:

There are no mandatory training sessions in experimental design and statistical analysis; this would be part of the individual advanced training and arranged by the students themselves so it is tailored to their own needs.