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BSc Bioscience project types

Laboratory and field-based projects

Lab projects allow students to work within one of the state-of the art research laboratories in the Faculty. The projects will be hypothesis-driven and address a specific research question that is of interest to the host laboratory. It is anticipated that students will develop experimental design and technical skills specific to the project topic. Note that the content, style and techniques used in these projects will depend heavily on the research of the supervisor.

Biomodelling projects (BMP)

These projects use computers to build models of biological processes such as metabolism, intracellular signalling, electrical activity in neurones, ion transport across epithelia, blood flow in the circulation, or homeostatic regulation of the body fluids. The students are expected with their supervisor's guidance to identify a biological system and a question that interests them. During the first semester, the students will write a literature review about the biological system. At the same time, they will receive training in the use of MATLAB software, a programming language widely used in scientific computing and engineering. During semester 2, the student will build, test and refine a computer model of their system using either published data or current experimental data from their supervisor's laboratory. It is important to note that no previous programming experience is required or expected for either the student or the supervisor.

Bioinformatics

These projects are just like any other biological project, in that they address a particular research question, but are carried out exclusively using computers (databases and software applications). The students are expected with their supervisor's guidance to identify a biological system and a question that interests them. During the first semester, the students will write a literature review about the biological system. At the same time, they will receive training in how to interrogate the myriad of biological databases that are available and in the required programming languages. During semester 2, the student will use these computing skills to extract, interrogate, analyse and interpret the relevant information from the appropriate biological databases to test their hypothesis. This will include a suitable statistical analysis of the extracted data. It is important to note that no previous programming experience is required or expected for either the student or the supervisor.

Enterprise projects

The Life Sciences Enterprise Project (LSEP) is a collaboration between FBMH and the Manchester Science Enterprise Centre (MSEC). Supervisors of this project type will manage a team of six students through the process of identifying a possible commercial product from basic biological research. Each student is expected with their supervisor's guidance to identify a biological system and a question that interests them. During the first semester, the students will write a literature review on the biological system and develop an original idea for commercialisation based on this topic. Each student will then produce a poster outlining their possible product and the team of six students will decide, with their supervisor's guidance, which of the six different ideas should be developed as a group into a business proposition. The team of six students will then develop a business plan for this proposition and pitch the idea to a panel of 'potential investors'. Prior business experience is not essential for these projects, as the students will attend supporting business workshops.

History of Science, Technology and Medicine projects (HSTM)

HSTM projects are designed for students who want to develop a broader picture of how people develop, promote and receive scientific and medical ideas. Working with staff from the Centre for the History of Science, Technology and Medicine (CHSTM), students will perform original research on a particular case, through techniques which may include archival research, oral history interviewing or intensive literature searching. Drawing on this material, students will construct a reasoned argument – for example, explaining why a particular event occurred, or what its effects were – and use it to frame an extended piece of writing. Available case studies are based on supervisors' research expertise, and range from the nineteenth century to the present day.

eLearning projects (ELP)

eLearning Projects involve the design, development and evaluation of an online resource that aims to enhance the understanding of a particular biological concept, mechanism, or process. Resources usually support the undergraduate curriculum (virtual practical, problem-solving activity), or promote the public understanding of science in more general terms (by showcasing research, for example). Evaluation is a key feature of project work and you would normally be expected to develop a hypothesis to test the effectiveness of your resource on a particular target group. eLearning projects are not simply 'text on the web', but should use the online environment and associated technologies (such as audio & video) appropriately to engage the target group in an interactive learning experience. You do not need to be

familiar with the technologies that are used; full training and support is provided in a dedicated series of seminars and workshops.

Education projects (EDU)

Education projects involve the creation and evaluation of resources or activities for schools/colleges or undergraduates, events at the museum or in the wider community (general public). Examples include activities for Open Days or Museum visits (e.g. Coupled Oscillators in Biology- NF-κB Rhythms of Life Exhibit), games to enhance problem-solving in a particular topic (for tutorials, medical or dental students, e.g. teaching Pharmacology students about nicotinic receptors), interactive lessons (e.g. The development and evaluation of physiology teaching resources for infants). Education projects are not simply concerned with teaching a class. There must be a clearly identifiable product, the utility of which you have demonstrated with rigorous data. The most essential thing to bear in mind is that the examiners will not be able to observe delivery/use of the product - you have to convince them of its utility using data and well-supported arguments. These often appeal to students who want to do a PGCE, but should also be considered by anyone interested in how to communicate bioscience. Again, seminars provide essential skills.

Science media projects (SMP)

Science Media Projects aim to communicate a particular biological topic to a range of target groups, and involve production of a portfolio of communication materials. This will contain an article for A Level Review plus reviewer's comments, an article for New Scientist or similar publication, an oral presentation to a scientific audience, and free-choice creative piece such as a video, podcast or poster , for example, that must be evaluated by the intended target group. The final portfolio should contain each of these pieces, plus an introduction to science communication, evaluation of the creative piece and a reflective log.

Public Engagement

PET projects require students to work as part of a small team to plan, design, deliver and evaluate a public engagement activity that will form part of a larger event held normally at the Manchester Museum (e.g. a Big Saturday event). Other science events could also be considered for the PET eg British Science Week or a Science Festival. Each team member will be expected to produce an individual component of the activity. The team will have one supervisor.

MSci Year 3 – MSci Research Project Proposal Unit

This is a two semester unit seen as a preparation for the 4th year module (see below). The students are expected to attend a week-long series of seminars and

interactive sessions on how to understand and critique scientific literature – this small group teaching is led by faculty staff who are research active, experts in their own field and whose areas of expertise are appropriate to the MSci degree specialities. During this element of the module students will be asked to produce an abstract from material provided (5%), a critical review of a published paper (in the style of an academic peer reviewer) (10%), a 2-page grant proposal (10%), with oral "pitch" to the academic panel (5%). Then, over each of the two semesters, each student will select an academic member of staff with whom they might wish to undertake their 4th year "placement" (ie 1 per semester, 2 in total). With each of these, the student will build a project proposal plan, concisely (in 5 pages) laying out their proposed line of experimental work for the year in the supervisors laboratory, with appropriate time lines and alternatives at choice-points. Each of these reports is worth 35% of this 20 credit unit. Having completed both reports each student is then able to make an informed choice between the two supervisors for their 4th year project. Staff are expected to have at least 3 scheduled face-to-face contacts with their students during the semester (and some limited email contact), to include giving feedback on an A4 plan and a full draft of the final report. Each member of staff will be the primary maker of their student's final report and the moderator of one of the other reports in the same semester.

MSci Year 4 – MSci Research Project

The 4th year of the MSci degree is a single 120 credit unit which is entirely laboratory based, in that each student, building upon the experience of the their Year 3 Proposals (see above), undertakes a hypothesis driven set of experiments appropriate to their degree speciality. This project is carried out in a single laboratory, under the supervision of a single PI and their research team. The PI will have supervised this student in one of the project proposals in the previous (3rd) year. The purpose of this project is to provide hands-on research experience in a research-active environment. The student is encouraged to develop their own research question within the confines of their laboratory environment, under clear guidance from the supervisor. During the course of the academic year, each student is expected to give a scientific talk, produce a "scientific-meeting" level abstract and finally a 25 page report with associated poster presentation. At all times they are encourage to integrate themselves into the laboratory "culture" – attending seminars, lab meetings etc. It follows that while the fixed points of examination remain the same across the student group, the projects themselves are absolutely unique and there is a great deal of emphasis on the project being guided from within the research group, rather than centrally, much as would be the case for a new post-graduate student. Thus, the timing and conduct of the project must be seen as a

collaborative effort between supervisor and student, though at this level the supervisor may expect their student to work longer hours and work outside the fixed semester calendar. While staff should have regular contact with their students, this should be arranged to be convenient for both staff and student and may often be virtual rather than face-to-face. During the course of the year, the student will also have the regular contact with their personal advisor.

MBChB or Applied Personal Excellent Pathway (APEP) project types

Research APEP

Research projects allow students to work within one of the state-of the art research laboratories in the Faculty. The project will be hypothesis-driven, and address a specific research question. It is anticipated that students will develop experimental design and technical skills specific to the project topic. Note that the content, style and techniques used in these projects will depend heavily on the research of the supervisor.

Service Evaluation Project

Service evaluation projects are designed and conducted solely to define or judge current care, asking the question "What standard does this service achieve?". Service evaluation usually involves analysis of existing data, and may include administration of interview or questionnaire. There is no randomisation and it does not require NHS REC review. A service evaluation measures current services without referring to a standard, or with any intervention. Choice of treatment happens before a service evaluation.

Clinical Audit Project

Audits are popular non-research projects, these assess whether best practice is actually being delivered to patients, they focus on the process and outcome, not on the individual.

An audit helps to:
- ensure patients receive the best possible care
- identify areas of deficiency/overlap in practice
- identify areas of good practice
- set standards where none exist
- improve efficiency and effectiveness of service
- improve patient satisfaction
- support bids for resources
- inform need for organisational change

Systematic Review Project

A systematic review is a summary of the results of carefully designed healthcare studies (often controlled trials) using transparent explicit methods. It involves defined stages through to completion. These involve clearly formulated questions with clear definition of inclusion/exclusion criteria. Then there is the creation of a protocol

which acts as a road map for undertaking the systematic review. The review aim is to use all available accessible evidence, which requires explicit description of searches, identification and selection of material used. It then uses structured appraisal of the literature and synthesis of the data. The outcome is an explicit, reproducible summary with minimum bias. This is why in hierarchy of evidence the systematic review is seen as the best source of information. They are commonly used in evidence based medicine but also highly valued in all fields of science.

When statistical methods are used to integrate estimates of effects from selected studies that are independent but common to the research question in order to summarise them this is termed meta-analysis. Thus data can be synthesised and analysed within a statistical model, providing quantitative answers to the research question.

Critical Appraisal Project

Critical appraisal is the process of carefully and systematically examining research reports to judge its trustworthiness, value and relevance in a particular context. Although critical appraisal methods can be used in systematic reviews, the term here describes the synthesis of information from wide range of study types and has a more narrative discussion. Important components include evaluation of the appropriateness of the study design to the research question plus careful assessment of the features of the methodology used. There is review of the statistical methods and interpretation of the results. The interpretation of the findings considers and states the limitations of the study. Thus one can use the process to evaluate a collection of studies for review both to determine whether to include them or their weighting given to their findings when considering evidence in medicine.