Why Research Skills?

Presents and explores the processes of scientific research:
- How am I going to make sure I achieve this?
- What do I intend to get out of postgraduate study?
- Why did I choose this course over others?
- Why am I doing a Diploma/MSc?

Following questions.

If you have not done so before, you may find it useful to consider the following questions.

Why am I doing a Diploma/MSc?

Some Questions

At the start of your postgraduate studies:

Why Research Skills?

Preparation for the MSc Practicum (CAS545/BE594/CA635/CA625):
- Reporting your findings
- Analyzing results
- Planning the investigation
- Literature review
- Forming a research hypothesis

Why Research Skills?

Notes, slides, assignments, etc for Research Skills:

MSc in Bioinformatics:
http://www.computing.dcu.ie/~gjones/Teaching/CA546MBIO/

European Masters in Business Informatics:
http://www.computing.dcu.ie/~gjones/Teaching/CA546EBIN/

MSc in Software Engineering:
http://www.computing.dcu.ie/~gjones/Teaching/CA545/BE594/CA635/CA625/

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Transferrable Skills

This module will give you the opportunity to develop the following:

- Locating sources of information.
- Retrieving, interpreting, contrasting and summarizing existing reports or presentations.
- Planning, working to time plans.
- Analyzing work.
- Reviewing, interpreting, contrasting analytical and summarized reporting of research projects, particularly in science or engineering.
- Transferrable skills, and possibly others as well.

Postgraduate Study

You must pass all the assessments:

- Although of course you need to focus on the syllabus and make sure you understand what is expected of you, your real interests in a subject.
- Potential employers/research supervisors will often look beyond your qualifications to find out about your real interests in a subject.
- If a topic is interesting feel free to read beyond set material.
- You should not feel restricted to only studying the course material.
- Come back to - what do I intend to get out of postgraduate study?
- Should not feel restricted to only studying the course material.
- Plan to take responsibility yourself for your learning.
- Did you feel like an extension of undergraduate study?

Research Process

Research is an original contribution to knowledge.

Postgraduate studies lead to one or more conclusions.

For the sequential or incremental testing of a number of smaller hypotheses.

A postgraduate project involves the testing of a single (possibly quite complex) hypothesis.

- If $x$ is true, then $y$ must be true as well.
- If $a$ and $b$ occur with $c$, then they should occur with $d$ as well.

Research projects (particularly in science or engineering) typically involve a cycle of forming and testing hypotheses.

A research project (particularly in science or engineering) involves developing and testing an hypothesis.

Research projects usually involve a cycle of forming and testing hypotheses.

A project may involve the testing of a single (possibly quite complex) hypothesis.

If the current hypothesis is found to be false, the next stage is to extend it to form a new hypothesis that needs testing.

If the current hypothesis is found to be true, then is often refined or extended to form a new hypothesis that needs testing.

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Assessing Contribution

Appropriate contribution varies depending on the qualifications sought. MSc/MPhil requires less than PhD. Personal guidance on this should be available from your research supervisor(s). It is also a good idea to look at some existing successful dissertations for supervisors (s)’ research. Appropriate contribution varies depending on the qualification sought. Research Skills

A research project may be very clearly defined at the start with a well-defined single hypothesis or series of hypotheses to be tested. Alternatively, the project may only be vaguely defined. Supervisors decide this is an interesting area to work in, there are lots of interesting and unsolved problems, let’s start work and see where it leads us.

Research Training

- Did I rush to speak to my supervisor too quickly?
- Did I wait too long to discuss this problem with my supervisor?
- Did I start the experimental work without sufficient literature review?
- Was the best design of experiment possible to make maximun use of time?
- How much reading did I do before beginning the experimetnal work?
- What research skills did I use in my approach to the learning process?
- Reflection on your experience is an important part of the learning process. So you might reflect on these questions:
- etc. can be quite different in their approaches.
- A postgraduate research project is a training qualification in conducting research within your discipline (physical sciences, social sciences, arts, etc.)
- A word of caution.

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The first option is generally safer, but often less exciting with less scope for the personal contribution from the student. Significant personal contribution from the student.

At the end of the day the decision of success or failure rests with the examiner(s). Qualitative researchers continue to face this situation repeatedly every time they submit work for publication or proposals for research grant funding. Reviewers will read and accept or reject their submission.
Getting Started: Familiarity with the Literature

**Goal:** Find out what has already been done. And who has done it.

- Delimits the research problem.
- Identifies new and current approaches and trends.
- Helps in identifying and understanding methods.
- Helps prevent you repeating existing work (although you may want to help expand existing work if you believe it is deficient or that a reassessment is timely for some reason).
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**Relevant sources and types of knowledge:**
- Work backwards - in classes where cited - can lead to the key sources.
- Contrast sources and types of knowledge.
- Evaluate content over style.
- Beware "common knowledge".
- Keep review up-to-date as you find more references.
- Synthesize and reference.

Relevant literature can come from many sources:
- Dissertations.
- Journals/conference proceedings.
- Bibliographies/Books.
- Increasingly the Web.
- Observe:
  - Why are some topics/measurement difficult to learn/make?
  - What can be learned by studying current practice?
  - Why is a particular experiment/methodology less than satisfactory?

**Identifying a Research Question:**

Observe:

1. Why is a particular experiment/methodology less than satisfactory?
2. What can be learned by studying current practice?
3. Why are some topics/measurement difficult to learn/make?

When reviewing literature:

- Be open minded.
- Evaluate content over style.
- Beware "common knowledge".
- Keep review up-to-date as you find more references.
- Synthesize and reference.

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Identifying a Research Question

Derive:
- inspiration from published work, e.g. seek to verify, replicate, refute, extend existing theories or methods.
- apply existing theory to your work.
- resolve conflicting or contradictory findings.
- correct methodology in earlier work.

Avoid:
- poorly defined topics: do you have a new slant?
- overworked topics: do you have a new slant?
- trivial topics: is the answer obvious? will you learn anything? is there any contribution to knowledge?
- unanswerable questions: is the topic amenable to methods proposed?

General Factors:
- Is the topic applicable, new, worth having?
- Equipment, tools, participants, time available?
- Background and skills?
- Interest? Underestimated?

Consider:
- Personal Factors:
- Interests?
- Time available?
- Budget?
- Facilities?
- Equipment?

Identifying a Research Question

Some Common Mistakes

- Poor definition of context: lack of theoretical or conceptual framework.
- Poor basis: unsupported claims and assumptions.
- Poor definition of context: lack of theoretical or conceptual framework.
- Poor definition of context: lack of theoretical or conceptual framework.
Some Common Errors in Planning

- Time Available: Everything takes longer than you think.
- Availability of data, software, equipment: Is it here now? When will it be here?
- Really? Are we? Will it be here soon enough?
- Compromising: Limiting the scope of the investigation too soon. Not exploring the alternatives sufficiently.

Even if:
- Research can be highly creative, rewarding, personally satisfying and fun!
- Negative results can lead to the greatest insights or new ideas.
- Some things work out and some things do not.
- Researchers have good days and bad days.

Research Life