The Research Question: make or break of post-graduate effort

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Target audience

Those about to embark on a foundation research project for their career: examples

- Honours
- MSc
- PhD
- First research job

Common thread is the desire for a quality product because of its influence on the next career step.

Recommendation

You cannot gain sound insight into developing or improving your research question and approach to study by sitting through a lecture of this nature.

I therefore recommend that each and every one of you devise a means of working through some of the points raised in the talk with a close colleague/peer.

No matter how harsh some criticism might sound at an early stage, if it can improve a project then it should be embraced.

Talk Outline

1. Research Question: Development and Execution
2. How do questions arise? Types of questions.
3. Group Exercise: Research Questions
4. Proposal and reading
5. Planning and Implementation: Feasibility; Study Design
6. Troubleshooting

Research Question: Development and Execution

1. Identification OR ‘How do questions arise?’.
2. Conceptual development OR ‘Why’
3. Planning OR ‘What, Where, and When’
4. Planning: Feasibility check
5. Planning: constraints
6. Implementation

How do Questions Arise?

1. Component research of technology development – next stage for improving production. Research on a ‘real world’ issue that progresses through a number of stages, each of which is suitable for component research.

2. Component research of “big” science, e.g., global science; this has become commonplace.

3. Concept development – development of understanding to date begs the next question. Understanding may have developed through empirical advances or theory.

4. Inductive moments – an individual identifies a special question based on theory or research experience. Such questions invariably have a strong conceptual basis. These questions cannot be planned.

Types of Research Questions

1. Technical
2. Applied
3. Conceptual - empirical
4. Conceptual - theoretical
5. Prediction – e.g., modelling

6. What else – add from floor based on own experience.

Group Exercise: ‘What kind of Research Question do you have?’

1. Organise into a group of 3, 4 or 5 without leaving your position.
2. Appoint a scribe.
3. Each person clearly articulates their research question in ONE sentence.
4. State how the study came to be – is it one of the origins presented in the preceding slide? If not please state so that we can expand the list.
5. Note that saying your supervisor was the origin of the question is not a valid answer.
6. Through group interaction rate yourself (1 to 5; 5 perfect) on whether your question is as clear as it could be; how it could be.
7. We will obtain an overview of the breadth of research questions and their origin being addressed by this group.

Why is initial statement of a research question so important?

The research question you address will guide the scope and extent of your study.

If it is clear, it should be easy to plan and execute the study.

With component research, the ‘big’ overall project may be excellent but it is important to assess whether your component is a good stand-alone endeavour.

The 1/3, 1/3, 1/3 rule

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Third of your time spent on planning

Third of your time spent on data generation

Third of your time spent on writing up

WHY?

A pet issue: 1/3 on planning=proposal

Planning = Proposal

Cannot overdo a proposal

Explore subtleties of the Research Question

Ensure it is contemporary

Up to date on approach and methods in field

Pre-empt problems

Save time on write-up

Group Exercise: Proposal

Record on a piece of paper:

Level of study

Do you have a proposal?

If so, how many pages?

And have one extra column for later

Expectations of a proposal

Relevant to the ecology field I am in:

Includes a literature review

PhD: not less than 30-50 pages

Recommendation: should be obvious and never too late

Gaining a Sound Conceptual Foundation

One common approach

READ

READ SOME MORE

AND THEN EVEN SOME MORE

Read Efficiently

But if this reading is not targeted then you will simply waste an enormous amount of time.

You cannot read everything

First read important papers (eg reviews, highly cited papers) or papers which address very specific issues you need to address (eg methodological detail you **must** know about)

Skim reading a paper

1. Never read an entire paper to start with
2. Abstract
3. Final paragraph of Introduction (aims, objectives, questions)
4. Look at figures closely
5. Check out tables and get their drift if comprehensible
6. Conclusion or final couple of paragraphs of discussion
7. Develop a bibliography with one or two sentences of the main **relevance** of the paper for your study.
8. Only go back later and read in full if the paper is truly important for the study
9. You can do 30-40 papers in a day like this

Group exercise: How well read are you?

Approximately how many references were consulted?

Guestimate: <20; 20-40; 40-60; 60-80; 80-100; >100

Fill this onto the page for your group

Planning and Implementation

A good question does not mean that you will have a good study.

Three common causes of studies not achieving a desired quality:

1. Inappropriate study design for the question.
2. Insufficient time for data collection of analysis
3. Insufficient resources in the lab or field

Sound Study Design

The nature of studies conducted is too diverse to consider this in any detail, BUT some common problems:

1. Inappropriate variables measured.
2. Design for addressing the question is not sound – e.g., control is not really a control
3. Inadequate sample sizes for decent analysis.
4. Advances in technology not used to best advantage.

Recommendation: Go through your study design with a colleague/peer and attempt to fault (not confirm) the various choices you have made.

Feasibility - some issues

Superb study design except insufficient **time**.

Sound **logistics** – e.g., supply chain

No critical **weak link** – e.g., spare part for equipment will take 8 months to arrive.

Technical weaknesses

FEASABILITY

OVER AMBITIOUS

=

UNDER ACHIEVEMENT

Demonic intrusion

You can almost bank on something completely unexpected going wrong with a project a certain stage.

Field – eg transport unavailable at a critical time

Lab – essential chemical unavailable at a critical time

YOUR SUPPORT SYSTEM

Fail-safe (never) versus Safe Failure

Troubleshooting

Would you know if something was going wrong with your project? How would you identify this?

Are you capable of troubleshooting – i.e., identifying the cause of a problem

REQUIRES STRONG CONCEPTUAL KNOWLEDGE

UNDERSTANDING OF EQUIPMENT/PROCESS

Particularly pertinent for studies relying on technology for data collection or technological investigations.

Group Exercise: Where can things go wrong?

Within groups of four or five:

- Each person to identify two or so real concerns of what could go wrong with their study.
- State how you would know they had gone wrong.
- For each concern, note what contingency plan is in place.
- Get the group to arrive at a consensus vote on which is the highest risk project of the group (1=low; 5=high)

Take-home message

Does your study show the following:

- Good questions
- Grounded in a sound conceptual basis
- Realistic time frame
- Sound logistical/technical support
- Study maintains value even if the scope is trimmed
- Sound study design and data collection
- Data can be incisively analysed