Writing a Research Proposal/Protocol

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What is research?

Research is the systematic collection, analysis and interpretation of data to answer a question or solve a problem revealed through a search of the current published literature on a particular research topic.
Research

HOW?

READ THE LITERATURE

IDENTIFY THE PROBLEM

ASK THE QUESTION

ANSWER THE QUESTION
Proposal versus Protocol

A proposal is a plan to obtain funding or do research. Funding proposals usually involve a template that has to be filled in and submitted to the funding body. In South Africa this is usually the National Research Foundation, but other funding organizations include the Bill Gates Foundation, USAID and ILRI.

Do not confuse a research proposal with a research protocol. A proposal is meant to persuade your instructor, peers, or a grant-making committee, while a research protocol is meant to detail a study's methodology to meet specified ethical norms for animal and human subjects.

A research protocol clearly and plainly provides an overview of a proposed study in order to satisfy an organization's guidelines for protecting the safety of human or animal subjects who might be adversely impacted by the research. Research protocols are typically submitted to Institutional Review Boards (IRBs) within universities and research centres.
General Rules  UP: Protocols

There are no General rules about Protocols

G49.1.e Progress reports

G49.2 Submission of thesis

G49.2.d Ethics statement: the author declares that they have observed UP Code for Ethics

G50.1.a THESES A title and topic are approved by the relevant Postgraduate Committees and Head of Department. The Postgraduate Committee approves them or refers them back to the HOD. In the event of a dispute the Dean decides.

G50.1.c Appointment of Supervisors is by the HOD

Faculty of Veterinary Science: An agreement shall be signed between the student and supervisor
My rationale for a protocol

- My students should be writing the protocol and starting their thesis at the same time. Everything in the protocol can be cannibalised for the thesis.

- The executive summary helps the student to visualise their whole research project.

- The protocol helps me, as supervisor, to see rapidly if the thesis is feasible and if the research question is a good one, are the methods feasible and scientifically sound, will the data collection and experimental method help answer the research question.

- The literature review and references required will help ensure the student is not replicating someone else’s work.

- The student can learn about layout quickly and we will hopefully not sit with layout issues when the main thesis is completed.

- It makes sure all the forms the student and I need to sign are in one place (Protocol addendum).

- Deadlines for submission of Ethics forms, draft thesis, graduation etc should be included in the GANTT Chart.
Examples of Protocols

- Faculty of Health Sciences
  http://www.up.ac.za/media/shared/Legacy/HS%20Res%20Office/writingresearchprotocol.zp37755.pdf

- Wageningen University
  http://hyperinet.multimediacampus.it/images/LucieHomolova_Full_PhD_Project_Proposal.pdf

- Calgary University

- Salisbury University
  http://www.salisbury.edu/gsr/research/compliance/irb/Forms_Documents/research%20protocols.pdf
My template for a protocol

- **Title page**: the same as that used for an MSc or PhD in your Faculty (1 page)
- **Executive Summary**: Similar to the Summary or Abstract for a PhD or MSc (350 words)
- **Background and Motivation**: Why are you doing the research? What research problem have you identified? What benefits will result? What is your research question? Your hypothesis. What is the main aim or objective of your research (2-3 pages)
- **Literature Review**: with about 40 References (2-3 pages)
- **Methods**: including experimental method (qualitative/quantitative), study area, study population and sampling frame, sample size, materials required, instrumentation, methods and software for data analysis etc. (1-2 pages)
- **Workplan and timeline** (GANTT chart)
- **Budget** (Table)
- **Addendum**: includes ethics approval forms, agreement form between student and promoter, questionnaires, any other documentation required
A good research protocol:

- does not duplicate previous work;
- meets the ethical standards required for research involving humans or animals or the environment;
- answers the research question in a systematic, logical and convincing way and meets the study objectives;
- is feasible in regard to the study area, study population, sample size and time frame of the study;
- is analysed in a way that is appropriate for the type of data collected; and
- is affordable in relation to available funds.
Research topics

- How to select a research topic
  
  https://www.youtube.com/watch?v=nXNztCLYgxc&list=PL6dr1_iNtkeirR9FHM5QbcMrDGZH0dEGr&index=1

  https://www.youtube.com/watch?v=Ga7w-czB7lo&index=2&list=PL6dr1_iNtkeirR9FHM5QbcMrDGZH0dEGr

- Dependent and Independent variables:
  
  https://www.youtube.com/watch?v=_{Bmjuj}lZExQ&list=PL6dr1_iNtkeirR9FHM5QbcMrDGZH0dEGr&index=3
The research question

- In research, the ultimate aim of the thesis or dissertation you produce is to answer a research question that has not been adequately answered by someone else.
- Usually a student is given a “topic”:
- Eg “Please write about Brucellosis in South Africa”
- This is far too general.
- How do you think we could narrow it down into something you think could give a logical answer within a reasonable time?
More context:

Brucellosis in South Africa:

- Specific study area (e.g., “Moretele District”)
- Specific time frame (e.g., Between 2010 and 2015)
- Specific study population (e.g., Communal cattle)
- Comparison (e.g., Different breeds, Vaccinated or not, Different age groups, management system)
- Method of research (e.g., secondary data from state vet records; or experimental data obtained from bleeding a random sample of cows; or systematic literature review and meta analysis to answer questions)
Dependent and Independent variables

Bovine brucellosis prevalence in Moretele

- **Y**: Dependent variable
- **X**: Independent variables

- **Breed**: Dairy, Beef, Communal
- **Age**: X-axis range
- **Vaccinated**: X-axis range
- **Management**: X-axis range

The graph shows the prevalence of bovine brucellosis for different breeds (Dairy, Beef, Communal) across different age groups, vaccination statuses, and management types.
Ideas for a research project

- https://www.youtube.com/watch?v=oPWuqwbHA5I
Begin with the end in mind

To “Begin with the end in mind” means to start with a clear understanding of your destination. It means to know where you're going, so the steps you take are always in the right direction. (Steven Covey)

This is really important for students and supervisors
Where are you going to?

A Degree!
Start with the end in mind

Conclusion:

Write about 200 words, starting with:

“It is concluded that....
The best way to start writing a thesis is to think very hard about your message, or “story” – what are you trying to tell people and why is it different from what everyone else has said?

This can be done by looking for “key words” in your thesis or dissertation or research report.

What are the “key words” in your title?
Exam question:

“List 5 signs/symptoms of Diabetes”
Exam question:

“List 5 signs/symptoms of Diabetes”

Answer:

1. High blood sugar
2. Frequent urination
3. Glucose in urine
4. Poor circulation
5. Susceptibility to disease
Six of your own key words

- Write down 6 key words that you think define your proposed thesis
- Check them using a search engine to see if they lead to articles similar to what you want to write
The title?

Use your key words to write a title for your research protocol (15 words)
Introduction

- State the motivation for the work
- Give a short background
- Quote only relevant literature
- NEVER include results or your findings, opinions
- Research question or problem
- Hypothesis
- Aim and objective
- Work plan
Literature Review

- Go from general to specific
- Use your six key words as subheadings
- Relate key words to dependent and independent variables
- Logical flow
- Reference every statement made
Logical Flow

- Keep related ideas together under the same subheading
- Literature review is a summary of other’s findings
- Methods are those chosen for the thesis
- Results are new findings of the study
- Discussion is about the results of the study, new literature should not be included
- Conclusions are related to research question/ hypothesis/ objectives.
Methods

- Sufficient information for the work to be reproduced
- Statistical tests and Study area, study population, sampling frame, sample size, selection method (random or purposive), data collection methods
- Analysis programmes are described
- Methods already published should just be referenced, not described
- Only new methods or relevant changes to published methods should be described
- Instrumentation must include make, model and supplier
- Grade and source must be specified for chemicals and other research materials
- Logical flow
Data

1. Planning to analyse data
   - Why?
   - Steps

2. Exploring, summarising and presenting data
   - Types of Data
   - Distribution of Data
   - Comparing Groups
Plan before you collect data

Data analysis should not be a “reaction” to data already collected.

It should be a pre-study planned process based on:

1. The hypothesis you are trying to test
2. The population you plan to study
3. The types of data you plan to collect
Planning

- Describe the design, hypothesis and objectives of your study
- Decide what statistics are needed to prove/disprove your hypothesis and meet all of your objectives.
- Describe how these are calculated
- List the variables required and how these will be collected
- Classify the variables into types.
- Determine what analysis to perform to test for significance
Type of study

- Eg 1: Prevalence of bovine brucellosis in communal cattle in Moretele (MSc)
  Descriptive study, one population measured, serological survey

- Eg 2: Rift factors for brucellosis in commercial and communal cattle in Moretele
  Analytic study, has a comparison group therefore two groups measured (PhD)
Analysis method

Decide what statistics/parameters are needed to prove/disprove your hypothesis and meet all of your objectives. And describe how these are calculated.

- Eg 1: Prevalence of Bovine Brucellosis in Moretele
  - Prevalence rate = ? / ?

- Eg 2: Rift factors for Bovine Brucellosis
  - Odds ratios (OR), Relative Risk (RR), Prevalence
Types of variables

Categorical
- Nominal
- Ordinal

Numerical
- Discrete
- Continuous
Types of variables

Categorical variables:

- **Nominal:**
  - Categories have no natural order, but are identified only by name
  - E.g. gender: male vs. female

- **Ordinal:**
  - Some order amongst categories
  - E.g. disease severity: mild, moderate, severe
Types of variables

Numeric variables:

- **Discrete:**
  - Variable can only take on certain values
  - E.g. Number of cases or counts of people (i.e. 2, 200 cases ... NOT 2.32 cases)

- **Continuous:**
  - Can assume any numeric value
  - E.g. weight (70.8kg), age (0.5 years), height (1.5m)
Types of variables

- So what???
- Why do I need to know this???
- The type of variable decides what kind of statistical analysis you can/should do.
- Categorical variables → Proportion or %, Chi-squared tests, etc.
- Numeric variables → Mean, median, mode, t-tests, etc.
Likewise, the distribution of your data also determines what kind of statistical analysis can be performed, and what stats should be presented.

After data has been collected and captured, but before doing any formal statistics → EXPLORE THE DATA

Distribution of Data

EXPLORE THE DATA
Distribution of Data: Exploring data

- Make graphical displays of numeric variables
  - Stem and leaf plots
  - Box plots
  - Histograms
  - Bivariate (scatter) plots

- Make graphical displays of categorical variables
  - Bar / pie - charts
Examples

- Nominal data
- Data normally distributed
- Present means, standard deviations
- Comparing groups using e.g. t-tests
Examples

- Nominal data
- Data distribution skewed
- Present medians, IQR, etc.
- Comparing groups using e.g. Kruskall-Wallis test
Analyses commonly used in epidemiology

- **Descriptive Epidemiology:**
  - Describe the occurrence of cases by time (epi-curves), place (maps, charts, frequency tables), and person (charts, frequency tables).
  - Stratification

- **Measures of association:** 2 x 2 tables, multivariate analyses

- **Correlation**
Comparing groups

Can be done in an analytic and descriptive studies

Need to understand the data and your study population well before you can compare

- Type of variable being analysed
- Assumptions necessary for the procedure
  - E.g. Independent samples? Normal distribution?
    - Matching in the study design?
- The characteristics being testing
## The basics

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>Outcome variable</th>
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<tbody>
<tr>
<td></td>
<td>Dichotomous</td>
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<tr>
<td>Dichotomous</td>
<td>Chi squared</td>
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<tr>
<td>Continuous</td>
<td>t test</td>
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<tr>
<td>Continuous</td>
<td>t test</td>
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<tr>
<td></td>
<td>Correlation</td>
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<td></td>
<td>coefficient</td>
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</table>
| Predictor/Independent variable | Outcome/Dependent variable
<table>
<thead>
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</thead>
<tbody>
<tr>
<td>Continuous, normally distributed</td>
<td>Correlation, linear regression, F test</td>
</tr>
<tr>
<td>Continuous, not normally distributed or ordinal with &gt;2 categories</td>
<td>Spearman rank correlation</td>
</tr>
<tr>
<td>Nominal with &gt;2 categories</td>
<td>Analysis of variance (F test)</td>
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<tr>
<td>Dichotomous</td>
<td>Logistic regression (likelihood ratio)</td>
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<tr>
<td>Continuous, normally distributed</td>
<td>Spearman rank correlation</td>
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<td>Continuous, not normally distributed or ordinal with &gt;2 categories</td>
<td>Spearman rank correlation</td>
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<td>Nominal with &gt;2 categories</td>
<td>Kruskall-Wallis</td>
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<tr>
<td>Dichotomous</td>
<td>Contingency table (Chi-squared)</td>
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<td></td>
<td>Contingency table (Chi-squared)</td>
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<td></td>
<td>Chi-squared or z test</td>
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</tbody>
</table>

This can get complex …

…and this assumes no matching
Bibliography/References

- The layout of “References” is specific for a particular Faculty at the University
- UP mainly uses Harvard and Vancouver
- Assistance can be found on the Library website
  http://www.library.up.ac.za/referencing/
- Be VERY careful of layout and punctuation as some examiners look first at the bibliography
- More than half of your references should be from Peer Reviewed Journal articles and less than five years old
- Many references now come from the internet.
First things first

- In academia two things occupy time:
  - Urgent things
  - Important things

- It is important to prioritise important things (putting first things first) as they get lost under the huge number of “urgent” things (like email, or like a cell phone ringing)

- Organise time on a weekly, rather than daily, schedule, to make it more flexible.
# Creating a timeline

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<th>YEAR</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
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<tr>
<td>ACTIVITY</td>
<td>Jan-mar</td>
<td>Apr-Jun</td>
<td>Jul-Sept</td>
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<td>Field work</td>
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<td>Data analysis</td>
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<td>Thesis Defence</td>
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<tr>
<td>Submit article</td>
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</table>
Managing timelines

- Supervisors should give advice on dates of successive stages of the work. A draft programme of work should be agreed by the student and supervisor with indicative deadlines. This programme of work should include reports needed for the registration and annual monitoring procedures;

- Make sure that students record the outcomes of supervision meetings in their electronic Personal Development Record. The record should include a summary of the progress to date, action required, agreed targets for the next phase of work and a draft agenda for the next meeting.
Responsibilities of post graduate students

- Ensure that any circumstances that might require his/her mode of study to be modified or his/her registration to be extended, suspended or withdrawn, are brought to the attention of his/her supervisor(s) at the earliest opportunity;

- Discuss with supervisors the type of guidance and comment they find most helpful and agree to a schedule of meeting;

- Take the initiative in raising problems or difficulties, however elementary they may seem, bearing in mind that prompt discussion and resolution of problems can prevent difficulties and disagreements at a later stage;

- Maintain the progress of the work in accordance with the stages agreed with the supervisor, the presentation of written material, in sufficient.

- Students should be given detailed of the work programmes for the academic year at the beginning of the year.
Agreement between student and supervisor

- The conclusion of a **study agreement** that contains details about the responsibilities of both student and leader/supervisor.

- It contains a complete list of study requirements and specifications, as well as a **structured programme** with **target dates** for meetings, seminars, **annual submission of progress reports** and the completion of the different phases of the research process.

- Personal guidance to the student in the **identification of a research theme**, a **viable research proposal**, and evaluation of progress.

- Regular, **seminars** to stimulate presentation of preliminary research results.

- Schooling in the **scientific method** and **correct research methodology**.

- **Structured guidance** and cultivation of commitment and partnership.

- Study leader and student **publishing jointly** in peer reviewed journals

- Integration of postgraduate students in projects and **research teams**.

(SHSPH guidelines for research
Characteristics of a good supervisor

- A postgraduate research project undertaken by postgraduate students requires a supervisor who gives direction to the research project;

- The supervisor ensures that he or she is suitably qualified and has the time available;

- The supervisor has to be in command of the specific field of study as well as related fields;

- The supervisor should understand the layout of both the thesis and peer reviewed publications
Administrative duties: supervisor

- Be aware of Faculty guidelines
- Know the contact details of student administration
- Understand the methods used for ethics submission and where to find the documents
- Know deadlines and meeting dates for protocol committee, ethics committee, thesis submission etc
- Communicate with HOD re progress
Contract between student and supervisor

- Supervisors should be accessible to students as appropriate at other times than formal meetings;

- A draft of the thesis submitted by the student to the supervisor should be read within a period of time specified upon submission of the work.

- If the supervisor is then unable to return the work within the specified time, the student will be informed of the delay and given a revised date of return.
References


- Archer B 2015 Data Analysis for Research Development. Powerpoint SAFELTP: Outbreak Response Unit NICD