Eskom Expo for Young Scientists

HOW TO WRITE A RESEARCH PLAN

This document contains:

1. **Guidelines on how to write a Research Plan**
2. **Research Plan Templates for:**

   2.1. Scientific Investigations Projects/Experiments (Page 2)

   - Scientific Investigative projects follow a scientific method to test a hypothesis, usually through observations and experimentation. This involves collecting and analysing data to reach a conclusion

   2.2. Engineering Type Projects and Computer Science Projects (Page 3)

   - For these types of projects, a design process is followed according to criteria, to build and test-redesign-retest a prototype/product/solution e.g. a device or a computer code

   2.3. Social Sciences Projects (Page 4)

   - Social Sciences research involves an objective and systematic method of exploring and analysing human behaviour, social issues and other phenomena. It involves collecting qualitative and/or quantitative data

   2.4. Mathematics/Theoretical Projects (Page 5)

   - Mathematics projects explore quantity, structure, space and change. Starting with an observation, problem or question, make conjectures/hypotheses, prove your claim using new or existing methods, make valid deductions and test your ideas theoretically. Your reasoning and arguments must be logical

Guidelines on how to write a Research Plan

At Eskom Expo for Young Scientists, it is compulsory to write a Research Plan. The success of your project depends on how well you plan and think about your research. The Research Plan shows how you intend conducting your research. Hence, it is written in the future tense i.e. before you actually do your project. It also needs to be written in the 3rd person (do not use: I, We, Us, My etc.). When planning your project, consider "what", "why", "how", "when" and "where" you will do your research. What resources will you need? What literature do you have to read before starting the research? What time frames are needed to complete the research? Is this research doable? Think about ethical issues you may encounter and how you will address these. Do you have a mentor/supervisor/teacher/resource person to guide and support you?

In which of the above four project types does your research project fit? Select one of the four broad project types listed above. Complete the appropriate Research Plan using the guidelines, contained in this document. Delete all other Templates, including this page once you have completed your Research Plan.

Research Plan

SCIENTIFIC INVESTIGATIONS/EXPERIMENTS

NAME: _____

PROVISIONAL PROJECT TOPIC: _____

PROVISIONAL EXPO CATEGORY: _____

Delete all guidelines under the following headings once you have completed your Research Plan

Introduction

- Introduce the topic. What concepts/definitions will you be using?
- Briefly mention your background reading/literature review here.
- What are the benefits/significance of doing this research/who will benefit? Why are you doing this research?
- What research has already been done? How will your research be different/new/innovative?

Problem Statement

What problem/issue will you be addressing? Write the research question(s) or problem statement.

Aim

What is the aim/objective of this research project?

Hypothesis

Is a statement or claim about something that can be tested scientifically. Your research will test the hypothesis to accept/reject it or see whether it is correct/incorrect. Your hypothesis must be clear, simple and testable.

Variables

List the independent, dependent and the controlled/fixed variables

Method

1. Materials

- List the materials and equipment you will use

2. Procedure

- A step-by-step description of how you will use the materials/equipment to answer your research question/solve the problem/test the hypothesis
- How will you collect and record the data? How will you analyse the data?
- How will you ensure safety when conducting the experiments (research involving hazardous materials and procedures must be done in a laboratory under adult supervision)?

Time Frames

- This is your project work plan. Write down the dates when you will be doing each of the steps above, including a Literature Review.
- State the dates when you will periodically report to your teacher/mentor on your progress and seek guidance. Finally, state when you will write up your Project Report and complete the Poster.

References

- List a minimum of three references (e.g. science journal articles, books, internet sites) that you used to get information about your topic using the "Harvard" Referencing method.

Remember to: Read Eskom Expo's guidelines on Project Approval and Ethics (what research is not allowed) and Plagiarism. Sign the Plagiarism Form. Keep a Journal/Data Book to record all your thoughts, observations, data, and rough work.

Teacher's/Mentor's comments and suggestions:

Teacher's/Mentor's name, signature and date:

Research Plan

ENGINEERING TYPE/COMPUTER SCIENCE PROJECTS

NAME: _____

PROVISIONAL PROJECT TOPIC: _____

PROVISIONAL EXPO CATEGORY: _____

Delete all guidelines under the following headings once you have completed your Research Plan

Introduction

- Introduce the topic. What concepts/definitions will you be using?
- Briefly mention your background reading/literature review here. What are the benefits/significance of doing this research/who will benefit? Why are you doing this research?
- What research has already been done? How will your design be different/new/innovative?

Need or Problem Defined

What need/problem will you be addressing/fulfilling with your design or invention? Who is your target user?

Aim

What is the overall aim/objective of this research project?

Engineering Goals or Design Goals or Algorithms

What is/are the primary goal(s) you want to achieve with your prototype/design/solution? Your goals will help you to "test" the functionality of your design/solution.

Method

1. Materials

List the materials and equipment you will use

2. Procedure

- Design Criteria:
    - These are the specific requirements of your design/solution/program
    - Examples of these are costing, availability of supplies, power output, weight, storage/construction space, timeframe/time available for design and testing, performance goals/tasks, durability, style/appearance factors etc.
- A step-by-step description of how the materials/equipment will be used to build your prototype/solution and achieve your Engineering/Design Goals and Algorithms. The procedure must also take into account the design criteria outlined above.
- How will you test the prototype/solution and record the results?
- How will you ensure safety when building and testing the prototype/solution? Research involving hazardous materials and procedures must be done in a laboratory under adult supervision.

3. Preliminary Designs

- Include labelled diagrams (include scale, measurements with units) of the first prototype/solution and descriptions of the design ideas.

Time Frames

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- When you will write up your Project Report and complete the Poster?

References

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Research Plan

SOCIAL SCIENCES PROJECTS

NAME: _____

PROVISIONAL PROJECT TOPIC: _____

PROVISIONAL EXPO CATEGORY: _____

Delete all guidelines under the following headings once you have completed your Research Plan

Introduction

- Introduce the topic. What concepts/definitions will you be using?
- Briefly mention your background reading/literature review here.
- What are the benefits/significance of doing this research/who will benefit? Why are you doing this research?
- What research has already been done? How will your research be different/new/add new knowledge?

Problem Statement

What problem(s)/issue will you be addressing/exploring? Write the research question(s) or problem statement.

Aim

What is the aim/objective of this research project?

Research Question(s)

The Research Question(s) help focus the study and guides the methodology. It must be clear, concise, and answerable by your research (must not be a Yes or No answer)

Hypothesis

Is a clear, concise statement or claim about something, that can be tested scientifically. Your research will test the hypothesis to accept/reject it or see whether it is correct/incorrect

Variables

If your study involves cause and effects, list the independent, dependent and the controlled/fixed variables. Variables must be measurable

Method

- What is the overall design of your research e.g. Case Study, Descriptive Study, Experimental (cause and effect)?
- How will you collect your data e.g. through observations, interviews?
- What instruments will you use to collect the data e.g. Survey Form, Questionnaire
- Will you be using different instruments to answer the same questions, to cross-check if your data is reliable?
- Describe the sample: how many participants will be studied (sample size)? Who is your target group and is it representative of the larger population? Where are they located? What age groups, gender etc. will be studied? How will you select the sample? Will it be random or deliberate? How will you analyse and represent the data? Will you use statistics, descriptions with tables, graphs

Ethics

- How will you ensure that your research is ethical?
- Did you get permission to conduct the study e.g. from the Principal?
- You need to inform the participants, in writing about what the study entails, why you are doing it, and when and how the information will be used.
- You must get consent from the participants: Adults or Principal/Parent/Guardian for minors to do the study.
- How will you ensure confidentiality e.g. delete/block out names, contact details and other personal information?

Time Frames (Project work plan)

- The dates when you will: be doing each of the steps above and periodically report to your teacher/mentor on your progress. Finally, state when you will write up your Project Report and complete the Poster.

References

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Teacher's/Mentor's name, signature and date:

Research Plan

Eskom EXPO FOR YOUNG SCIENTISTS

MATHEMATICS/THEORETICAL PROJECTS

NAME: _____

PROVISIONAL PROJECT TOPIC: _____

PROVISIONAL EXPO CATEGORY: _____

Delete all guidelines under the following headings once you have completed your Research Plan

Introduction

Introduce the topic. What concepts/definitions will you be using?

- Briefly mention your background reading/literature review here.
- What are the benefits/significance of doing this research/who will benefit? Why are you doing this research?
- What research has already been done? How will your research be different/new/innovative?

Problem Statement

What problem/issue will you be addressing? Write the problem statement

Research Question(s)

The Research Question(s) help focus the study and guides the methodology. It must be clear, concise, and answerable by your research (must not be a Yes or No answer)

Aim

What is the aim/objective of this research project?

Hypothesis/Conjecture

Is a statement or claim about something that can be tested scientifically. Your research will test the hypothesis to accept/reject it or see whether it is correct/incorrect. Your hypothesis must be clear, simple and testable.

Definitions and Concepts

Define terminology and concepts you will be using

Method

- Provide a description of how you will use your observations/existing information/existing methods etc. to argue or prove your hypothesis/conjecture and answer the Research Question
- Which theorems/proofs/method will you be using?
- How will you minimise errors?
- How will you test your solution e.g. through working out examples?

Time Frames

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