The Scientific Process

Teacher's Workbook Checklist	
Date	
There are no gaps in workbook; all activities/ boxes are complete	
All AO3 points are well explained and written in full sentences (50-100 words for each point)	

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Features of Science

Some of the first work done on the functioning of the human mind used **introspection**, a method involving the researcher sitting down and having a think about what they felt and thought about what was going on in their head. Thankfully psychology has moved on a lot since then and has now adopted the **scientific method**.

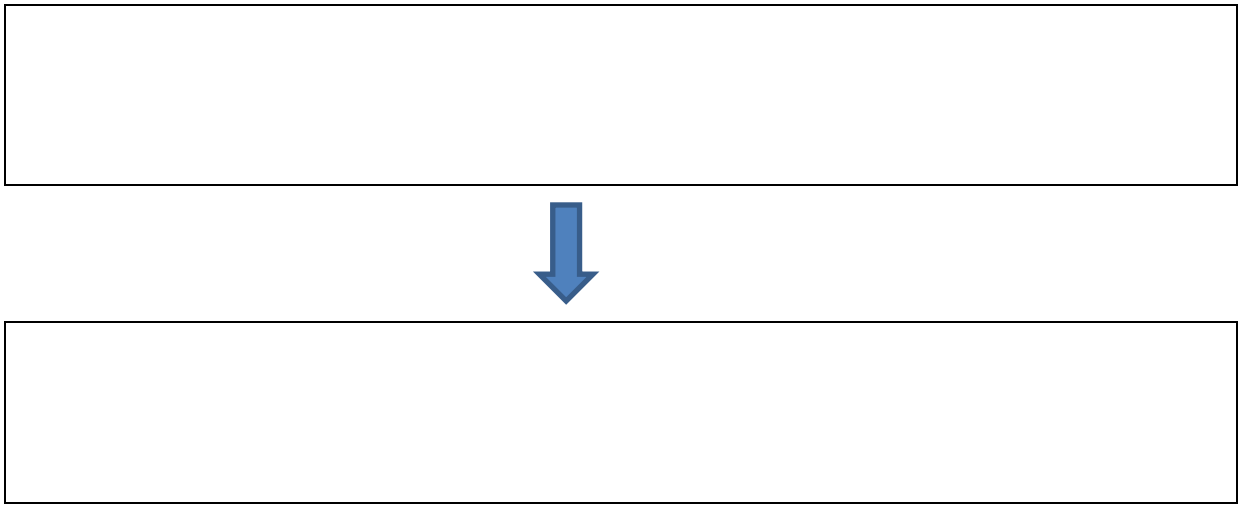
The scientific method requires theories to be **objectively tested**. The requirement for objectivity is based on the philosophical doctrine of **empiricism**. In order to be seen as objective, research must be **rational** and conducted and presented in such a way as to make it **replicable**.

Feature of Science	Explanation
Objectivity	
Empirical	
Quantitative Data	
Controlled Variables	Both the IV and DV must be controlled
Replicable	
Rational	
Paradigm	
Paradigm shift	

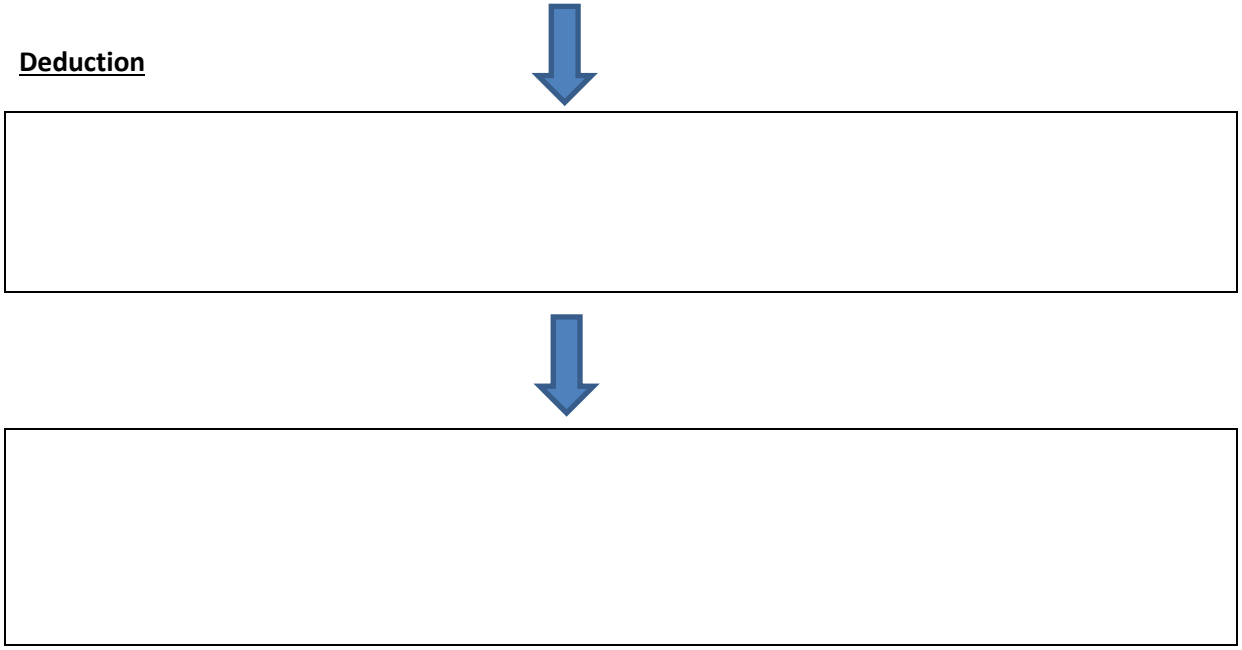
Theory construction

Two complimentary processes:

Induction:



Deduction



Falsification

Karl Popper (1935) believed that a **deductive** method was the best one to take because this involves proposing a theory and then seeking evidence to either support or contradict the theory.

Popper argued that this allows researchers to seek **falsification** which will allow them to show that the theory has been tested properly.

Popper argued that **falsification** was a unique feature of science.

Explain the **theory of falsification**

Peer Review

Peer review is very important throughout the whole of the scientific community and it has two major functions:

1. Researchers get to read other people's studies and keep in touch with **new ways of thinking and scientific developments**. They may also be working on the same topic or think they could improve upon or even disprove someone else's theory. Knowledge grows through the sharing of information.

2. Studies submitted for publication are subjected to **critical appraisal**, which acts as a brake to ensure poor quality research does not enter the public domain.

Most researchers aim to publish their findings in prestigious scientific journals and there is an agreed format for the way in which work is presented.

Having your study published means that the scientific community has given it a seal of approval; this is very important for university departments as they are assessed for future government funding on the quality of their published research.

Unlike textbooks, journals are published periodically and build into yearly volumes that serve as a permanent record of research. Universities keep these in their libraries and also subscribe to online publications. Some journals accept research from various areas, e.g., *Nature* or *Science.* In psychology, the *British Journal of Psychology* publishes studies from many different fields whereas some journals are extremely specialised, e.g., *Personality and Individual Differences*.

The system of peer review is held in high esteem and begins when a research paper submitted to a journal is considered to be worthy of publication. The editor sends this to other experts (who are generally unpaid) in the field who critically appraise all aspects of the study then return it with their recommendations as to whether the work is of acceptable quality. If not, researchers revise their work and re-submit their paper. This ensures that high standards are maintained.

However, peer review is not watertight and the system sometimes breaks down. Proven cases of fraud are a rarity, but include plagiarism, falsification of data and fabrication of data (UK Parliamentary Office of Science and Technology, 2002).

Conventions for Reporting Psychological Investigations

When psychologists submit their work for peer review, they have to write their reports according to a conventional style. Reports are scientific documents; they are written in the third person in the past tense in a plain text, such as '*Arial*' or '*Times New Roman'*.

All scientific reports follow a common order with each section starting on a new page:

I. **Title**

II. **Abstract**

III. **Introduction**

IV. **Method**

V. **Results**

VI. **Discussion**

VII. **References**

VIII. **Appendices**

Title

This is often derived from the variables under test, e.g., "The Effect of Exercise upon Stress Levels" and should be informative enough to enable the reader to know exactly what your study is about.

Abstract

This is always written *last* because it is a very brief summary (about 150 words) of your study.

Researchers planning an investigation often look in published books of abstracts or on the Internet to find support or counter-evidence for their theory.

Even scientific journals that charge to download documents provide abstracts free of charge.

Abstracts provide an efficient way of gaining information without having to read an entire study. They contain all the essential information that a researcher would need to know to go about replicating the study, such as background information, the aim/hypothesis, the target population and sampling method, the design, the results and whether the null hypothesis was accepted or rejected.

Introduction

This tells everyone why the study is being carried out and the commentary should form a 'funnel' of information.

First, there is broad coverage of all the background research with appropriate evaluative comments: "Asch (1951) found...but Crutchfield (1955) showed..." Once the general research has been covered, the focus becomes much narrower finishing with the main researcher/research area you are hoping to support/refute. This then leads to the aims and hypothesis/es

I. Aim

This covers exactly what it is you are hoping to find and how.

II. Hypothesis

This is a short, testable statement. The independent variable has to be operationalised and the dependent variable measureable. Justification has to be given for whether the test is to be directional or non-directional,

For example

Experimental/Alternative Hypothesis: Fewer words will be recalled by the Retroactive Interference Group, who learn a word list followed by another list that interferes with prior learning, than by the Non-interference Group who only have to learn one list of words.

Null Hypothesis: There will be no difference in the number of words recalled by either of the two groups. Any difference found will be due to chance alone.

Method - this section is split into sub-sections:

I. Design:

- Experimental/non-experimental method used – laboratory/field/natural or correlation or survey method
- Design type – independent groups, related measures, matched pairs, correlation, observation, interview
- IV, DV, EV
- Use of counterbalancing/ measures taken to avoid bias
- Ethical issues

II. Sampling method/ Participants:

- Relevant details of target population – age/socio-economic status, gender, etc.
- Relevant details of sample population
- Sampling method used
- Allocation to conditions
- Reports of those who dropped out

III. Apparatus/ Materials

- Description of all equipment used and how to use it (essential for replication)
- Stimulus materials for participants should be in the appendix

IV. Procedure

- This is a step-by-step guide of how the study was carried out – when, where, how
- Instructions to participants must be standardised to allow replication
- Lengthy sets of instructions and instructions to participants should be in the appendix

V. Ethics

Results

This section contains only a summary of the data. All raw data and calculations are put in the appendix.

This generally starts with a section of descriptive statistics – measures of central tendency and dispersion.

Summary tables must be clearly labelled and referred to in the text, e.g., "Table One shows that..."

Graphical representations of the data must also be clear and properly labelled and referred to in the text, e.g., "It can be seen from Figure 1 that..." Once the summary statistics have been explained, there should be an analysis of the results of any inferential tests, including observed values, how these relate to the critical table value, significance level and whether the test was one- or two-tailed.

This section finishes with the rejection or acceptance of the null hypothesis.

Discussion

Begins with a statement of the findings and how these relate to the original hypothesis.

All results are reported even if they do not fit the hypothesis or science would not progress.

The findings are accounted for in terms of how these relate to the researchers in the introduction.

All studies have flaws, so anything that went wrong or the limitations of the study are discussed together with suggestions for how it could be improved if it were to be repeated.

Suggestions for alternative studies and future research are also explored.

The discussion ends with a paragraph summing up what was found and assessing the implications of the study and any conclusions that can be drawn from it.

References

Every researcher cited in the text must be fully referenced using the Harvard System

Referencing is time consuming and seems very boring, but it is essential in order to prevent plagiarism.

You will have to provide a full list of references for all work that you hand in at university.

Many departments ask for both paper and electronic versions of your work, which can then be checked by programmes that look for evidence of plagiarism.

Appendices

This contains all the material too bulky for the body of the report, such as consent and debriefing forms, instruction sheets or stimulus materials and raw data and calculations.

These are numbered so they can be referred to in the text and easily found by someone reading the report.