



# Research and Thesis writing

## 1. Research models and methods

Many research students are required to undertake a research methodologies subject before they commence their research project. While this unit cannot take the place of such a subject, it is intended as a brief introduction to various research models, processes, and terminology for novice researchers who do not have direct access to information on research design. Once you have a basic understanding of different types of research and research terminology, you will be in a better position to seek your supervisor's advice as well as being better prepared for your initial supervision meetings. Where possible, references for further reading have been provided.

The type of study you undertake will depend on numerous factors such as the type of data you wish to collect, your research question and aims. Ongoing discussions with your supervisor and more experienced researchers will also help you to pinpoint the type of study, or the research methodology which will be most suitable for your research question(s).

## Research methodology

This section provides an explanation of research methods and design terminology and a list of further reading about each method.

### Empirical

This type of research requires that data be collected. Thus, empirical research is grounded in reality rather than in the some abstract realm. Data may be collected by observation or by experiment. The purpose of empirical research is to explain the data collected through the development of a model or theory that hypothesises about the relationship between the data and relevant variables of the environment. The results of empirical research should be able to be replicated as adherence to this method implies the use of objective, reliable and valid research methodology and criteria.

#### Further reading

Giere, R.N. (1979) *Understanding Scientific Reasoning*. New York: Holt, Rinehart & Winston

Gower, B. (1997) *Scientific method: An historical and philosophical introduction*. London: Routledge.

For a critique of empirical research methodology see: Chalmers, A. F. (1978) *What is this thing called science?* Queensland: University of Queensland Press.

### Theoretical

Provides explanatory principles for phenomena. It may remain on an abstract rather than a reality referred (data driven) level. In this type of research, theoretical principles are developed, proposed and described. Theoretical research is carried out in all disciplines.



### 1. Research models and methods



### 2. Developing a research proposal



### 3. Thesis Structure guidelines



3.1 Sample Abstract from Engineering & Biology



3.2 Sample Introduction from Engineering, Biology & Education



3.3 Sample Methods section from Biology, Engineering & Education



3.4 Sample Results section from Biology & Education



3.5 Sample Discussion section from Biology



3.6 Sample Conclusion from Engineering & Education



### 4. Thesis writing and persuasion

## Learning objectives

This module will help you to:

- learn about various research models.
- prepare a research proposal.
- structure your thesis and its chapters.
- write convincingly of your research outcomes and implications



### Further reading

Marx, M. (1979) Formal Theory. In M. Marx & F. Goodson (Eds.) *Theories in contemporary psychology*. Macmillan: New York.

Bell, P. & Staines, P. (1979) *Reasoning and argument in psychology*. UNSW Press: Sydney.

Cresswell, J. (1994), *Research Design: qualitative and quantitative approaches*. Sage: Thousand Oaks.

### Qualitative and quantitative

Generally qualitative research focuses on the subjective experience and perception of the research subjects. In qualitative research, the researcher is the key instrument of data collection. Tools used include open ended interviews, field notes, 'conversations' with participants or journal diaries. The focus of qualitative research is not only to describe but also to analyse: it seeks to look at the *why* of events not just the *what* (Tuckman, 1988). In contrast, the focus of quantitative research is objective measures rather than subjective experience. Data is collected in some objective and replicable manner; this methodology provides greater distance between the data and researcher than in qualitative studies. In addition, data is usually analysed statistically in this type of research. The tools of quantitative research include test performance scores, physiological readings, survey responses and spectrometer readings.

### Further reading

Cresswell, J. (1994), *Research Design: qualitative and quantitative approaches*. Sage: Thousand Oaks.

Tuckman, B.W. (1988) *Conducting educational research (3<sup>rd</sup> ed.)*. San Diego: Harcourt, Brace, Jovanovich.

Dey, I. (1993) *Qualitative data analysis: a user friendly guide for social scientists*. Routledge: London.

Ely, M. (1991) *Doing Qualitative Research: circles within circles*. The Falmer Press: London.

Guba, E.G. & Lincoln, Y.S. (1985) *Naturalistic Inquiry*. Sage: Newbury Park, Calif.

Howell, D.P. (1987) *Statistical Methods for Psychology (2<sup>nd</sup> ed.)*. PWS-Kent: Boston.

### Action research

Used in applied settings such as the classroom or a health care environment, this approach involves the practitioner as researcher collaborating with students or work colleagues in order to bring about change, to develop new skills or to problem solve in a particular situation that directly arises from the setting. A distinguishing feature of this approach is its spiraling and cyclical nature typically involving stages such as planning, action, observation and reflection. An example of action research is the introduction by the researcher of self assessment criteria for student learners. The research would investigate the effect of this innovation. Collaborative and/or reflective aspects of such a project may include a discussion with students about their input, perceptions and evaluation of the innovation.

### Further reading

Kemmis, S. & McTaggart, R. (Eds.) (1988) *The action research planner*. Deakin University: Victoria.

Stringer, E (1996) *Action research: A handbook for practitioners*. Sage Publications: Thousand Oaks, Calif.

Zuber-Skerritt, O. (Ed.) (1991) *Action research for change and development* Aldershot, Hants & England: Sydney.

### Case study

This type of research looks in depth at particular issues with a single or small number of subjects. Advantages of case study research are that the researcher can investigate a characteristic and/or its development in depth and at close range. This approach is also often used in fields such as neuropsychology to investigate cases of rare or unique pathology.

#### Further reading

Brumfit, C. & Mitchell, R. (Eds.), (1989). *Research in the Language Classroom*. Modern Languages Publication/British Council: London.

Shaughnessy, J. & Zechmeister, E.B. (1985) *Research methods in psychology*. New York: A.A. Knoph.

### Ethnographic

Ethnographic research is a means of gaining insight into a culture or social process. It involves participant observation, which means the researcher becomes immersed in the daily lives of the people or community he or she is observing. Data for ethnographic studies may include field notes, interviews, taped conversations.

#### Further reading

Fielding, N. (1993) Ethnography. In N. Gilbert (Ed.) *Researching Social Life*. Sage: London, pp. 154-171.

Hammersley, M. & Atkinson, P. (1983). *Ethnography: principles into practice*. Tavistock: London.

### Experimental

This type of research uses quantitative methods and involves a formal control of variables. It may occur in a laboratory situation. *True experimental studies* investigate possible cause and effect relationships by exposing one or more experimental groups to one or more treatment conditions and comparing them to control groups who are equal in other respects but do not receive the treatment/s. This type of design allows a comparison to be made and a conclusion drawn about the effect of the treatment. For example, to investigate student learning from computers one group of students learn about a topic using the conventional teaching materials (the control group) while another learns about the same topic using the same information except the information is presented on a computer. Students would be randomly assigned to the groups or matched using some valid criteria. Variables such as intelligence, prior knowledge of the topic, familiarity with a computer and gender would need to be accounted for or controlled in this process. Other variables such as time of day and number of students in a learning group would be equalised or randomised across the groups in order that these variables are also controlled. After the learning period, the students' knowledge of the topic would be assessed using an identical test for both groups. Objective criteria would be used to establish the test results of the groups. A conclusion about the effect of using a computer for learning can then be drawn, as the other variables that would impact upon the ability of the students to learn have been controlled. Experimental designs demand scientific principles such as objectivity, replicability and validity be upheld.

Out of a laboratory it is often difficult to control all of the variables that impact upon an experiment. *Quasi-experimental designs* use experimental methodology without total control of relevant variables. Although the researcher in this situation

compromises the internal validity of the experiment (since not all variables are controlled), they may gain some external validity as the results they have obtained would be generalisable to other similar situations in the real world.

#### Further reading

Feibleman, J.K. (1972) *Scientific Method: The hypothetico-experimental laboratory procedure of the physical sciences*. Nijhoff: The Hague.

Agnew, N.M. & Pyke, S.W. (1969) *The Science Game: an introduction to research in the behavioural sciences*. Englewood Cliffs, N.J.: Prentice Hall.

Kerlinger, F. (1979) *Behavioural research: A conceptual approach*. New York: Holt, Rinehart & Winston.

For information on quasi-experimental methodology:

Shaughnessy, J. & Zechmeister, E.B. (1985) *Research methods in psychology*. New York: A.A. Knoph.

#### Interventionist

As the term implies, interventionist studies involve some deliberate change in a particular process or situation so that the effects can be monitored and evaluated. Interventionist studies tend to have less control over variables than experimental studies. An interventionist study on student learning could involve the introduction of different teaching approaches to enhance learning. It may not be possible to achieve a control group (controlling all variables such as socioeconomic status, performance and prior knowledge) who are taught only using the old teaching approach and materials given factors such as ethics and real classes and courses. Action research is a type of interventionist research as all participants intervene to create change. Interventionist research also occurs in a more scientific research setting where change can be engineered by an agent external to the experimental groups.

#### Phenomenological

This approach investigates ordinary human life experiences within their context to discover meaning. Thus, an individual's 'life world' or 'living experience' is studied as he or she experiences it rather than looking to categorise the experience or theorise about it. Examples are frequently used in this approach to illustrate the significance of the 'life experience' being described. An example of a research question using this approach is what is the nature of the experience of becoming a nurse?" and the aim of this research would be to understand this experience (Munhall, 1994).

#### Further reading

Benner, P. (1994) *Interpretive Phenomenology: Embodiment, Caring, and Ethics in Health and Illness*. Sage: Thousand Oaks.

Munhall, P. (1994) *Revisioning Phenomenology: Nursing and Health Science research*. National League for Nursing Press: New York.

The following terms are design variations that you may want to consider. They can fit within one or more of the preceding research methodologies. Reference to these terms may be found in standard research texts such as:

Cohen, L. & Manion, L. (1985) *Research methods in Education (2nd ed.)*. Croom Helm: London.

Burns, R.B. (1997) *Introduction to research methods (3rd ed.)*. Melbourne: Longman.

Cozby, P.C. (1985) *Methods in behavioural research (3<sup>rd</sup> ed.)*. Palo Alto, Calif.: Mayfield.

Guba, E.G. & Lincoln, Y.S. (1985) *Effective Evaluation*. Jossey-Bass: San Francisco.

### Longitudinal

In this type of study data is collected repeatedly over a period of time in order to document or measure changes which have occurred in the population over the period of the study. For example, to investigate student's learning, students taught about the same topic using either a paper based or computer based technique for information presentation may be tested immediately after learning, one month after learning and six months after learning. This approach would investigate whether the learning benefits associated with a particular presentation technique continued over time. Longitudinal studies may also occur over many years and have a *developmental* focus or a *correlational* focus. Data for longitudinal studies can include surveys, interviews, diaries, test results, documents such as student writing.

### Developmental

Investigates patterns and sequences of growth and/or change as a function of time.

### Correlational

Investigates two or more existing situations in order to determine and explain their differences and similarities.

### Multi-Method Research

Data is gathered about a range of related issues using a mix of methods.

### Triangulated data/triangulation of data

It involves the comparison of data relating to the same issue or phenomenon of investigation but from different perspectives or from different methods of collection: for example, comparison of data from different stages of research; comparison of data from different sets of participants; or comparison of data from different tests that purport to measure the same variable. Data is therefore cross-checked in order to confirm the hypothesis. Triangulation of data can show up disjunctions in the research results, as well as provide additional insights.

### Grounded Theory Research

Data is gathered and analysed to generate hypotheses that are grounded in practice.

### Interpretive

Data is gathered that generates 'thick' description & interpretation and that allows theory building.

### Historical

Reconstructs the past objectively and accurately, often in relation to the tenability of an hypothesis.

### Descriptive

Systematically describes a situation or area of interest, factually and accurately.

### Evaluative

Determines whether a particular program or procedure is providing the expected outcome.

The next unit in this module will help you to establish and refine a research topic as well as to prepare a research proposal.