RESEARCH METHODOLOGIES

Qualitative and Quantitative Research

Most research can be categorised as falling into one of two paradigms: the qualitative or the quantitative.

The qualitative paradigm concentrates on investigating subjective data, in particular, the perceptions of the people involved. The intention is to illuminate these perceptions and, thus, gain greater insight and knowledge.

The quantitative paradigm concentrates on what can be measured. It involves collecting and analysing objective (often numerical) data that can be organised into statistics.

Each of these two approaches involves different ways of thinking about the world - and, hence, investigating it.

	Qualitative Research	Quantitative Research
Also Known As	interpretative / responsive	positivist /hypothetico-deductive
Type of reasoning involved	(usually) inductive i.e. using observation to formulate an idea or theory	(usually) deductive i.e. taking a known idea or theory and applying it to a situation (often with the intention of testing if it is true)
Link with concepts	identifies concepts	uses identified concepts and investigates relationships
Action	sometimes only describes a situation BUT in action-research openly intervenes	tests relationships between concepts (the proposed theory) by looking for facts that support or deny the suggested relationship.
Outcome	illuminates the situation to allow those involved in the hope that greater understanding will lead to improvement.	accepts or rejects proposed theory
Approach to validity	truth seen as context bound (socially constructed)	truth seen as objective and universal

Descriptive Research

That which seeks to accurately describe current or past phenomena. It seeks to answer such questions as:

- What is the absentee rate for particular lectures?
- What is the pass rate for particular courses?
- What is the dropout rate on particular degree programmes?
- What effect does a particular quality audit process have on teacher morale?

Descriptive research is often strongly quantitative in nature. The first three of the four sample research questions above require the collection of measurable (i.e. quantifiable) data. However, it can also be qualitative when it seeks to describe phenomena which cannot readily be ascribed an objective (rather than comparative) value. The fourth sample research question above illustrates this. This question also illustrates how most qualitative research will include the processing of quantitative data. Any investigation into the effects of quality audits on teacher morale is likely, for example, to seek to quantify the numbers of teachers who feel quality audits have an effect on morale and the numbers who feel that they do not.

Typical methods used in descriptive research are:

- Statistical surveys
- Sampling
- Interviews

Analytical Research

This takes descriptive research one stage further by seeking to explain the reasons behind a particular occurrence by discovering causal relationships. Once causal relationships have been discovered, the search then shifts to factors that can be changed (variables) in order to influence the chain of causality.

Typical questions in analytical research are:

- Why is there a preponderance of female students in teacher training programmes?
- What factors might account for the high drop-out rate on a particular degree programme?

Typical methods used in analytical research include:

- Case studies
- Observation
- Historical analysis
- Attitude surveys
- Statistical surveys

When there is very little in the existing literature to guide the focus of analytical research, the researcher may start by using general data gathering techniques such as surveys or observation in order to try and see whether there are any recurrent patterns in the situation. Discovering these patterns can lead to the formation of a hypothesis and/or a more focused research question. Analytical research of this kind is often called "exploratory research".

Analytical research can be quantitative or qualitative depending on whether the focus is on exploring factors, such as attendance, which can be assigned a definitive value, or factors which cannot be given such a definitive value, such as attitudes or beliefs.

Reflection upon the two sample research questions given above might provide insights into why it is relatively easy to find examples of research that are purely quantitative but difficult to find examples of purely qualitative research. Most qualitative research benefits by some form of quantitative processing of data, even when the overall focus is highly qualitative.

Predictive Research

This seeks to forecast the likelihood of particular phenomena occurring in given circumstances. It seeks to answer such questions as:

- Will changing the start time achieve a higher attendance rate at our lectures?
- Will introducing anonymous marking reduce the gender imbalance in the GPA scores of graduating students?
- Will increasing the weighting for course work encourage students to adopt deep learning strategies?

Predictive research is nearly always quantitative because it involves identifying and/or defining measurable (i.e. quantifiable) variables which can be manipulated to cause measurable (i.e. quantifiable) effects.

Experimental Research *('true scientific research')*

This tests causal relationships by observing the behaviour of the subject under conditions where some variables are controlled and others manipulated. Strictly speaking, the term *experiment* should be confined to those actions or series of actions where it is possible to do all of the following:

- Randomly assign the subjects of the experiment to either an experimental group (to which something is done) or a control group (to which the thing done to the experimental group is not done).
- Manipulate (do something to) the experimental group.
- Ensure that in all other important aspects, the factors affecting the experimental and control groups remains the same.

In the technical jargon, one would say that a true experiment must be distinguished by the three characteristics of 'random assignment', 'manipulation' and 'control'. By definition, experimental research is always quantitative.

Quasi-Experimental Research

As with true experimental research, the goal of quasi-experimental research is to test cause and effect by observing how subjects react to phenomena. It is, therefore, at least in intent, a quantitative approach. However, in quasi-experimental research full control is not possible because one or more of the three characteristics of true experimental research is missing. In educational research, it is rarely possible to control all the variables. This, of course, means that confidence in assertions of causality must be weaker than in the classic experiment.

There are many different procedures that are used in quasi-experimental research. Two of the most common are:

- **Using a non-equivalent control group**
  In this model the researcher does not randomly assign subjects to a control or experimental group. Rather an experimental group is chosen and a similar group is selected as the 'non-equivalent' control group. For example, someone researching into the effects of using peer-assessment might compare two groups of students on similar courses, one where peer-assessment is used and one where it is not.
  The key differences between this model and that of the classic experiment is that subjects are not randomly assigned to each group and the researcher is, usually, unable to control all random variables. The basic weakness of the method is the lack of certainty about the exact degree of similarity between the experimental and control groups and the possibility of 'contamination' by other variables e.g. the quality of the teaching might be better in one group than in the other.

- **Making a series of observations on a single group before and after the experimental change (known as 'Time Series Design')**
  In this model, the researcher makes a series of observations ('pre-tests') on a group of subjects to establish an existing pattern. S/he then makes the experimental change and, again, observes the behaviour of the group over time (in a series of 'post-tests'). If there is a consistent and measurable change, it is considered reasonable to infer causality.
  For example, suppose a group of students fail to use the Harvard Referencing System correctly after three coursework assessment episodes. Suppose in response, that the teacher then devotes three hours of teaching time to a workshop on the use of the Harvard System. If, in each of the next three assessment episodes the numbers of students failing to use Harvard correctly diminishes, then it is reasonable to suppose that the workshop had a positive effect.

These two common quasi-experimental methods are contrasted with the classic experimental process in the following tables.

1A) Procedure of the Classic Experiment

Random Assignment	»	Experimental Group	»	Pre-test	»	Experimental Treatment	»	Post-test
	»	Control Group	»	Pre-test	»	No Treatment	»	Post-test

1B) Non-equivalent Control Group

Recognition of non-random Groups	»	Experimental Group	»	Pre-test	»	Experimental Treatment	»	Post-test
	»	Control Group	»	Pre-test	»	No Treatment	»	Post-test

1C) Time Series Design

Simple Group	» Pre-test	» Pre-test	» Pre-test	»	Experimental Treatment	» Post-test	» Post-test	»	Post-test

Non-Experimental Research

This is the investigation of phenomena as they really are. No attempt is made to change the subject of the research in the process. Examples of non-experimental research are:

- surveys
- longitudinal studies
- correlational studies
- case studies

Here we are talking about descriptive, exploratory and/or analytical case studies. It is possible to have case studies that are experimental. In practice, this is most often seen when case studies are used in the evaluation of new techniques, processes or material.

Non-experimental methods are often used in educational research because many phenomena that are of interest to educators do not fit the experimental method. For example, a researcher might be interested in the relationship between alcohol consumption during the final year of undergraduate study and final GPA achieved. Obviously, one would not want to set up an experiment where alcohol consumption by final year undergraduates was the controlled variable. Some form of survey or co-relational study would appear to be more appropriate.

Surveys

Surveys are where a study is made of a sample of a larger population in order to draw inferences about that population because the resources are not available to study every member. If the sample is properly representative, i.e. if it is statistically likely that the important characteristics of the larger population are proportionally balanced in the smaller sample, then further statistical analysis can be used to draw inferences about the larger population.

Surveys can be conducted by interview (face-to-face, telephone, or email) or by questionnaire.

Surveys can be *descriptive* or *analytical*:

- *Descriptive* surveys seek to count the frequency of defined characteristics within a population.
- *Analytical* surveys seek investigate causal relationships between variable characteristics of a population.

Longitudinal Studies

Here phenomena are studied over time either continuously or repeatedly. Such studies reveal relative stability and allow change to be studied within an overall context. The reasoning is that it should be possible to suggest likely explanations from an examination of the process of change and the patterns which emerge". Longitudinal studies are usually, but not exclusively, quantitative.

Correlation Studies...

Investigate how strongly pairs of variables are related. Correlation is measured on a scale from -1 (which indicates a perfect inverse relationship) to +1 which indicates a perfect linear relationship. A total absence of relationship is indicated by 0. This is sometimes referred to as a 'random relationship'. This numerical result is called the 'correlation coefficient'.

There are several techniques for such investigations and several different coefficients that can be used. The most common is the Pearson or 'product-moment' correlation. This has the symbol 'r'. Thus, using Pearson, a perfect positive relationship can be expressed as r = 1, while a total absence of relationship would be expressed as r = 0.

However, the square of the Pearson coefficient multiplied by 10 is always equal to the percentage of the change in one variable that can be attributed to a change in the other. (In practice, you just ignore the decimal point after squaring.) Thus r = .5 becomes r^2 = .25 becomes r^2 = 25%, which means that twenty-five percent of the change in one variable is related to the change in the other.

The most important thing to remember when dealing with correlation is that it does not demonstrate or prove causality.

Case Studies

A case study is an in-depth examination of a single instance of a phenomenon or a single member of a population. For example, a single student, a single cohort, a single instance of curriculum innovation. It can be thought of as research in depth rather than breadth in that a deliberate choice has been made to examine large numbers of factors by limiting the number of cases investigated.

Case studies need to be both comprehensive and systematic. That is, as much data as possible needs to be collected in a way that ensures as little as possible is missed. Even so, generalisations from a sample of one must be made, if at all, with extreme caution. Case studies are best suited to either illuminating situations or phenomena in such a way as to suggest avenues for further investigation or to testing out previous findings in the field.

Problem Solving Research / Action-Research

In a very real sense, almost all research can be seen as a stage in the problem solving process. In order to find solutions to problems one must first be able to accurately describe the situation, then be able to analyse it and then to predict the likely consequences of any intervention.

In the world of education, action research is pre-eminently suited to solving those problems where there is some discrepancy between an educational practice and the expectations in terms of which the practice was undertaken. It is a form of problem solving based on increasing knowledge through observation and reflection, then following this with a deliberate intervention intended to improve practice.

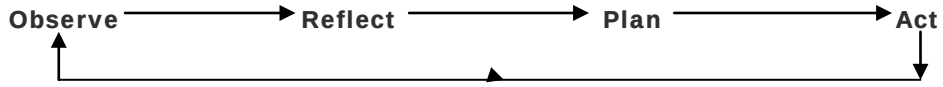
It is any systematic inquiry, large or small, conducted by professionals and focusing on some aspects of their practice in order to find out more about it, and eventually to act in ways they see as better or more effective". Thus, *educational action-research* can be said to be "any inquiry teachers undertake to understand and improve their own practice".

This simple definition does not specify what methods are acceptable or appropriate for such inquiry. Such specification is needed in order to avoid the pitfall of educational action-research being regarded as nothing more than writing down what a good teacher does anyway.

The Australian National Invitational Conference on Action-Research defined educational action-research as "a term used to describe a family of activities in curriculum development, professional development, school improvement programmes, and systems planning and policy development. These activities have in common the identification of strategies of planned action which are implemented, and then systematically submitted to observation, reflection and change. Participants in the action being considered are involved with all of these activities." Essentially, action-research consists of a number of phases:

- Observing
- Reflecting on this observation
- Planning either a change of practice or a gathering of further data
- Acting (by making the change or gathering the data)
- Observing the effects of the change (or looking at the data)
- Reflecting on this observation (or analysing the data)
- Planning a further change or data gathering process
- Acting to make the change or gather the data
- Observing the results
- Etc.

This process is known as the 'action-research spiral' and is often depicted in diagrammatic form:



However, real life research projects often do not fit neatly into cycle of planning, action, observation and reflection. It is perfectly legitimate to follow a somewhat disjointed process if circumstances dictate. Action-research projects, then, are likely to be more 'messy', in practice, than a straightforward description of the action-research spiral would suggest. However, describing each phase separately makes it easier to understand.

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