Research design, methodology, tools, data analysis and presentation

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Abstract

The study presents research design as a strategy that guides investigators; a logical model for inferring causal relations. It makes the relationship between experience and reasoning by showing research as the most successful approach to the discovery of truth, particularly as far as the natural sciences are concerned. The aim of the study is to present a) specific styles of research; b) specific issues in planning a research design, e.g. sampling, validity, and reliability; c) planning data collection – instrumentation and; d) data analysis and presentation. The intention here is to provide a set of issues that need to be addressed in practice so that an area of research interest can become practicable, feasible and capable of being undertaken.

Introduction

'Research is best conceived as the process of arriving at dependable solutions to problems through a planned and systematic collection, analysis, and interpretation of data….. a back-and-forth movement in which the investigator first operates inductively from observations to hypotheses, and then deductively from these hypotheses to their implications. In order to check their validity from the standpoint of compatibility with accepted knowledge. After revision, these hypotheses are submitted to further test through the collection of data specifically designed to test their validity at the empirical level.' (Mouly, 1978).

Research has three characteristics in particular which distinguish it from experience:

1. Whereas experience deals with events occurring in a haphazard manner, research is systematic and controlled, being its operations on the inductive-deductive approach.

2. Research is empirical. The scientist turns to experience for validation. Subjective belief must be checked against objective reality.

3. Research is self-correcting. Not only does the scientific method have built-in mechanisms to protect scientist from error as far as is humanly possible, but also their procedures and results are open to public scrutiny by fellow professionals.

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There is no single blueprint for planning research. Research design is governed by the notion of 'fitness for purpose'. The purposes of the research determine the methodology and design of the research.

A framework for research design

The process of operationalization is critical for effective research. What is required here is translating a very general research aim or purpose into specific, concrete questions to which specific, concrete answers can be given.

The process moves from the general to the particular, from the abstract to the concrete. Thus, the researcher breaks down each general research purpose or general aim into more specific research purposes and constituent elements, continuing the process until specific, concrete questions have been reached to which specific answers can be provided.

This can be arranged into four main areas (Morrison, 1993):

1. orienting decision;
2. research design and methodology;
3. data analysis;
4. presenting and reporting the results.

Orienting decisions

Orienting decisions set the boundaries or the parameters of constraints on the research. They address the overall feasibility of the research.

1. **Be inclusive with thinking.** Don't try to eliminate ideas too quickly. Build on the ideas and see how many different research projects a researcher can identify. Give the luxury of being expansive in his thinking at this stage. Try to be creative. For example, the overriding feature of the research is that it has to be completed within six months; this will exert an effect on the enterprise. On the one hand, it will 'focus the mind'; on the other hand, this may reduce the variety of possibilities available to the researcher.

2. **Write down ideas.** This will allow the researcher to revisit an idea later on. On the other hand, he can modify and change an idea. If the researcher does not write his ideas, they tend to be in a continual state of change and he will probably have the feeling that he is not going anywhere. What a great feeling it is to be able to suit down and scan the many ideas he has been thinking about, if they are written down.

3. **Try not to be overly influenced at this time by others.** You have a much better chance of selecting a topic that will be really of interest to you if it is your topic.

4. **Be realistic about the time for research.** Certain time scales permit certain types of research, e.g. a short time scale permits answers to short-term issues, while long-term or large questions might require a long-term data collection period to cover a

range of foci. Costs in terms of time, resources and people might affect the choice of data collection instruments. For example, what will be the minimum representative sample of teachers or students in a school, for interviews are time-consuming and questionnaires are expensive to produce. Research design enables the researcher to identify the boundaries within which the research must operate and what are the constraints on it.

5. **Preparing the research proposal**. Make sure that the researcher is familiar with other research that has been conducted in areas related to his research project; has a clear understanding of the steps that he will use in conducting his research; has the ability to get through each of the steps necessary to complete his research; and has the motivation and derive to get through any kind of hindrance during the research.

6. Make sure the proposal has a **comprehensive review of the literature** included. Now this idea, at first thought, may not seem to make sense. But, this is the time to do it. The rationale behind the literature review consists of an argument with two lines of analysis: 1) this research is needed, and 2) the methodology the researcher has chosen is most appropriate for the question that is being asked. This is the time to get informed and to learn from others who have preceded him.

7. What is a proposal anyway? **A good proposal should consist of the first three chapters of the dissertation.** It should begin with a statement of the problem/background information (typically Chapter 1), then move on to a review of the literature (Chapter 2), and conclude with a defining of the research methodology (Chapter 3). Of course, it should be written in a future tense since it is a proposal changing the tense to past (e.g. 'This is what I would like to do' to 'This is what I did').

8. It is important that the **research be organized around a set of questions** that will guide the research. When selecting these questions try to write them so that they frame the research and put it into perspective with other research. These questions must serve to establish the link between the present research and other research that has already been done. The research questions should clearly show the relationship of the present research to the field of study. The researcher must start with broad relational questions.

Research design and methodology

Research design includes addressing such questions as:
What are the specific purposes of the research?
How are the general research purposes and aims operationalized into specific research questions?
What are the research questions?
What needs to be the focus of the research in order to answer the research questions?
What is the main methodology of the research (e.g. a quantitative survey, qualitative research, an ethnical study, an experiment, a case study, a piece of action research etc)?
How will validity and reliability be addressed?

What kinds of data are required?
From whom will data be required (i.e. sampling)?
Where else will data be gathered (i.e. instrumentation)?
Who will undertake the research?
How will it be presented?

Sampling

The quality of a piece of research not only stands or falls by the appropriateness of methodology and instrumentation but also by the suitability of the sampling strategy that has been adopted. Researchers must take sampling decisions early in the overall planning of research. Unless the researchers identify the total population in advance, it is virtually impossible for them to assess how representative the sample is that they have drawn.

Suppose that you have been released from your teaching commitments for one month in order to conduct some research into the abilities of 13-year-old students to undertake a set of English Verb experiments and that the research is to draw on four secondary Urdu Medium schools which contain 60 such students each, a total of 240 students and that the method that you have been asked to use for data collection is a semi-structured interview. Because of the limited time constraint, it would be impossible for you to interview all 240 students. Therefore, you have to be selective and to interview fewer than all 240 students. How will you decide that selection i.e. or how will you select which students to interview?

If you were to interview 120 out of 240 students, would that be too many? If you were to interview just twenty out of 240 students would that be too few? If you were to interview just the males or just the females, would that give you a fair picture? If you were to interview just those students who are 'good at English', would that yield a true picture of the total population of 240 students? Perhaps it will be better for you to interview those students who are experiencing difficulty in English and who do not enjoy English, as well as those who are good at English. Therefore, you turn up on the days of the interviews only to find those students who do not enjoy English and have decided to be absent from the English lesson. How can you reach those students?

Decisions and problems such as these fact, researchers face in deciding the sampling strategy that is to be used. Judgements have to be made about four key factors in sampling:

1. The sample size;
2. The representativeness and parameters of the sample;
3. Access to the sample;
4. The sampling strategy to be used.

These decisions determine the sampling strategy which is to be used.

The sample size

There is no clear-cut answer, for the correct sample size depends on the purpose of the study and the nature of the population under scrutiny. Thus, a sample size of thirty is held by many to be the minimum number of cases if researchers plan to use some form of statistical analysis on their data. The most important factor here is the need to think out in advance of any data collection the sorts of relationships that they wish to explore within subgroups of their eventual sample. The number of variables researchers set out to control in their analysis and the types of statistical tests that they wish to make must inform their decisions about sample size prior to the actual research undertaking. Where simple random sampling is used, the sample size needed to reflect the population value of a particular variable depends both on the size of the population and the amount of heterogeneity in the population (Bailey, 1978). Borg and Gall (1979: 194-5) suggest that correlational research requires a sample size of no fewer that thirty cases, that casual comparative and experimental methodologies require a sample size of no fewer that fifteen cases, and that survey research should have no fewer than 100 cases in each major subgroup and twenty to fifty in each minor subgroup.

The sampling strategy to be used

There are two main methods of sampling (Cohan and Holliday, 1979, 1982, 1996; Schofield, 1996) which are:

a) probability method (random sample)
b) non-probability method (purposive sample)

A probability sample is useful if the researcher wishes to be able to make generalization, because it seeks representativeness of the wider population.

On the other hand, a non-probability sample deliberately avoids representing the wider population; it seeks only to represent a particular group of the wider population, e.g. a class of students, a group of students who are taking a particular examination, a group of teachers.

Probability sampling

A probability sample has less risk of bias than a non-probability sample, whereas, a non-probability sample, being representative of the whole population, may demonstrate bias. There are several types of probability samples: simple random samples, systematic samples, and multi-phase samples.

Simple random sampling

In simple random sampling, the method involves selecting at random from a list of the population the required number of subjects for the sample. This can be done by drawing names out of a hat, or by using a table of random numbers (Hopkins, Hopkins and Glass, 1996: 148-9). Because of probability and chance, the sample should contain subjects with characteristics similar to the population as a whole.

Systematic sampling

This method is a modified form of simple random sample. It involves selecting subjects from a population list in a systematic rather than a random fashion. For example, if from a population of 2,000 a sample of 100 is required, then every twentieth person can be selected. The starting point of the selection is chosen at random.

Stratified sampling

Stratified sampling involves dividing the population into homogenous groups, each group containing subjects with similar characteristics. For example, group A might contain males and group B, females. In order to obtain a sample representative of the whole population in terms of sex, a random selection of subjects from group A and group B must be taken.

Cluster sampling

When the population is large and widely dispersed, gathering a simple random sample poses administrative problems. It will be completely impractical to select students and spend an inordinate amount of time travelling about in order to test them. By cluster sampling, the researcher can select a specific number of school and test all the students in those selected schools, i.e. a geographically close to cluster can be sampled.

Stage sampling

Stage sampling is an extension of cluster sampling. It involves selecting the sample in stages, that is, taking samples from samples. Using the large community example in cluster sampling, one type of stage sampling might be to select a number of schools at random, and from within each of these schools, select a number of classes at random, and from within those classes select a number of students.

Multi-phase sampling

In stage sampling there is a single unifying purpose throughout the sampling. In stage sampling, for example the purpose was to reach a particular group of students from a particular region. In a multi-phase sample the purposes change at each phase, for example, at phase one the selection of the sample might be based on the criterion of geography (e.g. students living in a particular region); phase two might be based on an economic criterion (e.g. schools whose budgets are administered in markedly different ways); phase three might be based on a political criterion and so on.

Non-probability samples

The selectivity which is built into a non-probability sample derives from the researcher targeting a particular group, in the full knowledge that it does not represent the wider population; it simply represents itself. This is frequently the case in small scale research, for example, as with one or two schools, two or three groups of students, or a particular group of teachers, where no attempt to generalize is desired; this is frequently the case for action research or case study research.

The selection of a sampling strategy must be governed by the criterion of suitability. The choice of which strategy to adopt must be mindful of the purposes of the research, the time scales and constrains on the research, the methods of data collection, and the methodology of the research. The sampling chosen must be appropriate for all of these factors if validity is to be served.

Validity and reliability

Defining validity

Validity is an important key to effective research. Validity is requirement for both quantitative and qualitative/naturalistic research. In qualitative data validity might be addressed through the honesty, depth, richness and scope of the data achieved, the participants approached, or the objectivity of the researcher. In quantitative data validity might be improved through careful sampling, appropriate instrumentation and appropriate statistical treatments of the data. Validity, then, should be seen as a matter of degree rather than as an absolute state (Gronlund, 1981).

Defining reliability

Reliability is essential for consistency and reliability over time, over instruments and over groups of respondents. It is concerned with precision and accuracy.

So far, design issues have been discussed which are different from kinds of research to follow. The kinds of research enable the researcher to address the notion of 'fitness for purpose' in deciding the most appropriate style of research for the task in hand.

Research Styles

It is important to distinguish between matters of research design, methodology and instrumentation. Too often methods are confused with methodology, and methodology is confused with design. The kinds of research are:

Naturalistic research
Historical research
Longitudinal, cross-sectional studies
Case studies
Action research

Naturalistic and ethnographic research

In many ways, the issues in naturalistic research are not exclusive; they apply to other forms of research, for example: identifying the problem and research purpose; deciding the focus of the study; selecting the research design and instrumentation; addressing validity and reliability; ethical issues, approaching data analysis and interpretation. These are common to all research. More specifically Wolcott (1992:19) suggests that naturalistic researchers should address the stages of watching, asking

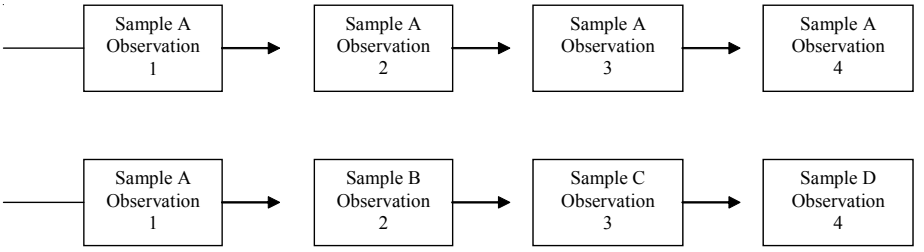
and reviewing, or, as he puts it, experiencing, inquiring and examining.

Historical research

Historical research has been defined as the systematic and objective location, evaluation and synthesis of evidence in order to establish facts and draw conclusions about past events (Borg 1963). It is an act of reconstruction undertaken in a spirit of critical inquiry designed to achieve a faithful representation of a previous age. In seeking data from the personal experiences and observations of others, from documents and records, researchers often have to contend with inadequate information so that their reconstructions tend to be sketches rather than portraits. Reconstruction implies a holistic perspective in that the method of inquiry characterizing historical research attempts to 'encompass and then explain the whole realm of man's past in a perspective that greatly accents his social, cultural, economic, and intellectual development' (Hill and Kerber, 1967). In historical research, it is especially important that the researcher carefully defines his problem e.g. where do the events take place? Who are the people involved? When do the events occur? What kinds of human activity are involved? And so on.

Longitudinal, cross-sectional studies

The longitudinal study (cohort) gathers data over an extended period; a short-term investigation may take several weeks or months; a long-term study can extend over many years. In this study, successive measures are taken at different points in time from the same respondents. In cross-sectional study (trend), a few selected factors are studied continuously at different points in time from different respondents. A cross-sectional study is one that produces a 'snapshot' of a population at a particular point in time.



Case studies

A case study is a specific instance that is frequently designed to illustrate a more general principle (Nisbet and Watt, 1984: 72), it is 'the study of an instance in action' (Andelman et at., 1980). A single instance is, for example a child, a class, a school, a community. It provides a unique example of real people in real situations, enabling readers to understand ideas more clearly than simply by presenting them with abstract theories or principles.

Action research

Action research **'is to plan, act, observe and reflect more carefully, more systematically, and more rigorously than one usually does in everyday life'** (Kemmis and McTaggart, 1992: 10). It is a form of collective self-reflective inquiry undertaken by participants in social situations in order to improve the rationality and justice of their own social or educational practices, as well as their understanding of these practices and the situations in which these practices are carried out. Action research may be used in almost any setting where a problem involving people, tasks and procedures cries out for solution, or where some change of feature results in a more desirable outcome. Action research is designed to bridge the gap between research and practice (Somekh, 1995:340). It contributes not only to practice but also to a theory of education and teaching which is accessible to other teachers, making educational practice more reflective (Elliott, 1991:54). Action research combines diagnosis with reflection, focusing on practical issues that have been identified by participants and which are somehow both problematic yet capable of being changed. A teacher can ask himself, 'What do I see as my problem? What do I see as a possible solution? How can I direct the solution? How can I evaluate the outcomes and take subsequent action?'

Specific tools for collecting data

The intention of specific tools is to enable researchers to decide on the most appropriate instruments for data collection, and to design such instruments. Some instruments for data collection are:

Interviews	Questionnaires
Observation	Tests

It is intended that, when decisions have been reached on the stage of research design and methodology, a clear plan of action has been prepared.

Interviews

The research interview has been defined as **'a two-person conversation initiated by the interviewer for the specific purpose of obtaining research-relevant information'** (Kvale, 1996:11). The use of the interview in research means generating knowledge between humans often through conversations on a topic of mutual interest. The purposes of the interview are:

- To evaluate or assess a person in some respect;
- To test or develop hypotheses;
- To gather data, as in survey or experimental situations;
- To sample respondent's opinions

The research interview may serve three purposes. First, it may be used as the principal means of gathering information having direct bearing on the research objectives, that is to say, 'what a person likes or dislikes (values and preferences), and what a person thinks (attitudes and beliefs)' (Tuckman, 1972). Second, it may be used to test hypothesis

or to suggest new ones; or as an explanatory device to help identify variables and relationships. And third, the interview may be used in conjunction with other methods in a research undertaking. In an interview as a specific research tool, set questions are asked and the answers recorded on a standardized schedule.

Before the actual interview items are prepared, it is desirable to give some thought to the question format and the response mode. Consider the following checklist for evaluating an interview.

Questionnaire Survey

There are many types of questionnaires. They can vary enormously in terms of their purpose, their size and their appearance. To qualify as a research questionnaire, however, they should:

- Be designed to collect information, which can be used subsequently as data for analysis. As a research tool, questionnaires do not set out to change people's attitudes or provide them with information.
- Consist of a written list of questions. The important point here is that each person who answers the particular questionnaire reads an identical set of questions. This allows for consistency and precision in terms of the wording of the questions, and makes the processing of the answers easier.
- Gather information by asking people directly about the points concerned with the research. Questionnaires work on the premise that if you want to find out something about people and their attitudes you simply go and ask them what it is you want to know, and get the information straight from them.

Observation

Observation offers the researcher an opportunity to gather **'live data from live situations'** (Patton, 1990: 203-5). Observations, it is argued (Morrison, 1993: 80), enable the researcher to gather data on:

- The physical setting (e.g. the physical environment and its organization);
- The human setting (e.g. the organization of people, the characteristics and make up of the groups or individuals being observed, for instance gender, class);
- The programme setting (e.g. the resources and their organization, pedagogical styles, curricula and their organization).

Tests

In tests, the researcher has at his disposal a powerful method of data collection, an impressive array of tests for gathering data of a numerical rather than verbal kind. In considering testing for gathering research data, several issues need to be borne in mind:

- Is the researcher dealing with parametric (represents wide population) or non-parametric (represents small groups) tests?

- Are the tests achievements potential or aptitude?
- Are the tests available commercially for researchers to use or will the researcher has to develop his test?
- Are they group or individual tests?
- How will the researcher score tests?

Data Analysis

The researcher needs to consider the mode of data analysis to be employed. In some cases this is very important as it has a specific bearing on the form of the instrumentation. For example, a researcher needs to plan the layout and structure of a questionnaire survey very carefully in order to assist data entry for computer reading and analysis; an inappropriate layout may obstruct data entry and subsequent analysis by computer. The planning of data analysis will need to consider:

- What needs to be done with the data when they have been collected – how will they be processed and analysed?
- How will the results of the analysis be verified, cross-checked and validated?

Decisions will need to be taken with regard to the statistical tests that will be used in data analysis as this will affect the layout of research items (e.g. in a questionnaire), and the computer packages that are available for processing quantitative and qualitative data, e.g. SPSS.

Qualitative data and Quantitative data

The terms 'qualitative' and 'quantitative' are research approaches. **Qualitative** approaches involve the collection of extensive narrative data in order to gain insights into phenomena of interest; data analysis includes the coding of the data and production of a verbal synthesis. **Quantitative** approaches involve the collection of numerical data in order to explain, predict, and /or control phenomena of interest; data analysis is mainly statistical. Qualitative data involves primarily induction while quantitative data involves primarily deduction. If hypotheses are involved, a qualitative approach is much more likely to generate them whereas a quantitative approach is much more likely to test them.

Qualitative research vs. Quantitative research

Words or numbers

Qualitative research tends to be associated with words as the unit of analysis.
Quantitative research tends to be associated with numbers as the unit of analysis.

The most elementary distinction between the two lies in the use of words or numbers as the basic unit for analysis. On the one hand, qualitative research relies on transforming information from observations, reports and recordings into data in the form of the written word, not numbers. On the other hand, there is 'quantitative research', whose aim is to measure phenomena so that they can be transformed into numbers to

analysis through statistical procedure – procedures which are very powerful but utterly dependent on receiving numerical data as the input. The quantitative data is transformed with what is observed, reported or recorded into quantifiable units. The sources of information need not differ between qualitative and quantitative approaches. What is different is the way the information is transformed into qualitative data (words) or quantitative data (numbers). In the case of qualitative data, taped interviews get transformed into transcripts, observations get recorded in field notes, pictures get described in words.

Description or analysis

Qualitative research tends to be associated with description.
Quantitative research tends to be associated with analysis.

Qualitative research is better suited to description. Whether dealing with meaning or with patterns of behaviour, qualitative researchers tend to rely on a detailed and intricate description of events or people (Geertz, 1973). The numbers are particularly well suited to the kind of comparisons and correlations demanded by any analysis of results.

Small-scale or large-scale

Qualitative research tends to be associated with small-scale studies.
Quantitative research tends to be associated with large-scale studies.

Qualitative research tends to favour small-scale studies. There is a strong tendency for qualitative research to be relatively focused in terms of the scope of the study and to involve relatively few people or situations. This reflects the preference for depth of study which only becomes possible in relation to limited numbers. Statistics tend to operate more safely with larger numbers. Quantitative research tends to favour larger-scale research with larger numbers and greater quantities. A statistical procedure can be undertaken by a computer on a sample of 2,000 as quickly as it can on a sample of 20. The results, though, will be more reliable when conducted on 2,000 than on 20. The larger the numbers involved, the more the results are likely to be generalizable and reliable statistically speaking.

Holistic or specific focus

Qualitative research tends to be associated with holistic perspective.
Quantitative research tends to be associated with a specific focus.

Qualitative research, generally exhibits a preference for seeing things 'in context' and for stressing how things are related and interdependent. The qualitative research tends to operate on the assumption that social 'realities are wholes and cannot be understood in isolation from their contexts, nor can they be fragmented for separate study of their parts' (Lincoln and Guba 1985:39). Quantitative research focuses on specific factors and to study them in relation to specific other factors. To do this, it is

necessary to isolate variable – to separate them from their natural location interwined with a host of others – in order to study their working and their effect.

Researcher involvement or detachment

Qualitative research tends to be associated with researcher involvement.
Quantitative research tends to be associated with researcher detachment.

Qualitative research tends to place great emphasis on the role of the researcher in construction of the data. It is recognized that the researcher is the crucial 'measurement device', and that the researcher's self (his or her social background, values, identity and beliefs) will have a significant bearing on the nature of the data collected and the interpretations of that data. On the other hand, the whole point of quantitative research is to produce numerical data that are 'objective' in the sense that they exist independently of the researcher and are not the result of undue influence on the part of the researcher himself. Ideally, the numerical data are seen as the product of research instruments which have been tested for validity and reliability to ensure that the data accurately reflect the event itself, not the researcher's preferences.

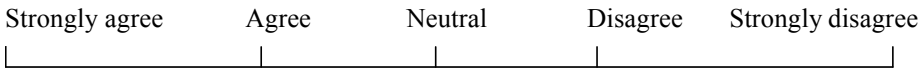
Types of quantitative data

For statistical processing the researcher needs to ascertain the level of data being processed – nominal, ordinal, interval or ratio as explained below:

Nominal data. Nominal data come from counting things and placing them into a category e.g. data from populations, where few or no assumptions are made about the distribution of the population or the characteristics of that population; or male/female.

Ordinal scales. Ordinal data are based on counts of things assigned to specific categories, but the categories stand in some clear, ordered, ranked relationship. The categories are 'in order'/ this means that the data in each category can be compared with data in the other categories as being higher or lower than etc.

The most obvious example of ordinal data comes from the use of questionnaires in which respondents are asked to respond on a five-point scale such as:



The responses coded as 2 are seen as more positive that those coded as 3, 4 or 5. This scale is known as the Likert scale.

Interval data. The interval data is like ordinal data, but the categories are ranked on a scale. The researcher can deal with the data in terms of how much more or how much less. This allows for direct contrast and comparison. For example to contrast the difference between various periods the difference between 1960 and 1970 can be directly compared with the difference between 1970 and 1980, and so on.

Ratio data. Ratio data is like interval data, except that the categories exist on a scale which has a 'true zero' or an absolute reference point. The categories give rise to ratio data because the scales have a zero point. Calendar years, do not exist on such a scale, because the year 0 does not denote the beginning of all time and history.

Preparing quantitative data for analysis

Coding the data. If the researcher wants to use quantitative data then he is involved in a process of coding the data. Suppose that the researcher is interested in investigate at what stage a group of young Urdu learners of English acquire copula *be*? The researcher intends to conduct a survey of 240 learners at different levels and in different age groups. Further, the group of young learners are from Urdu medium and English medium. Four separate tests containing 40 questions in each are asked the respondent to answer in such a manner that the copula *be* can be checked as correct or incorrect. This would result in a mass of data. In this format the data are difficult to handle and very difficult to analyse. Imagine the researcher's problem when faced with a list of 240 separate subjects with their 40 x 4 answers resulting total 240 x 160 = 38400. To make the analysis possible, the researcher needs to identify a smaller number of categories of groups into separate years, and then to assign each year one category. Each category will have a numerical code, and so the process of analysis involves coding each of the words by giving it a numerical value which accords with the category of year to which it fits. The data, in this format, is ready for analysis.

Grouping the data. The first stage in the analysis of quantitative data is to organize the raw data in a way that makes them more easily understood. Where there is a large number of categories, the researcher can organize the data by grouping the categories.

Age group	**Correct score of Copula *be* in Year groups**		
	Year1 group	Year2 group	Year3 group
Younger	115	553	781
Older	158	516	759

Table 1

Bar charts. Bar charts are an effective way of presenting categories, and they are very common in reports of small-scale research. The fewer the categories (bars), the more striking the impact is. Beyond ten categories bar charts tend to become too crowded and confusing to read. Figure 1 shows a simple bar chart.

The same information is presented easily through visual as given in Fig 1.

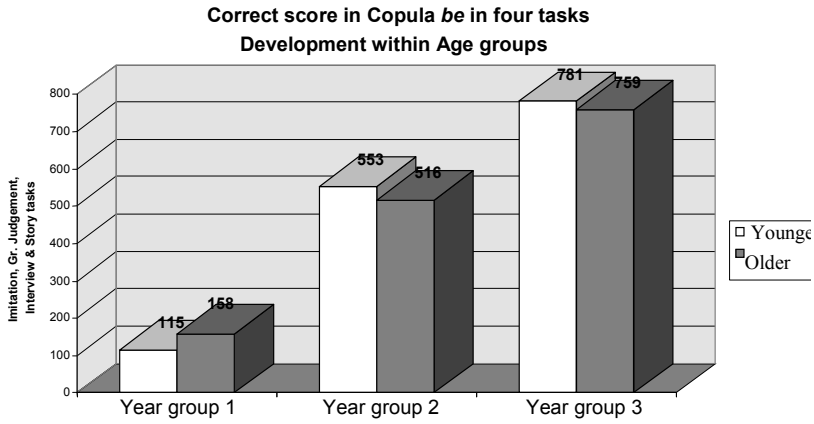


Figure 1

The above figure presents the result very clearly what each group has acquired during three-year time period.

Qualitative Data

The researcher plays an important role in the production and interpretation of qualitative data. The researcher's identity, values and beliefs cannot be entirely eliminated from the process.

Procedures for analysing qualitative data

Qualitative research produces large volumes of data in non-standard format. This poses a challenge for the researcher in terms of how to interpret the data. Most researchers using qualitative data start their analysis on the basis of a descriptive account, or narrative of the situation being investigated. The narrative requires a detailed description of the setting. The importance of this narrative is that it provides the information needed in order to make comparisons with findings from other research. There is a richness and detail to the data. The in-depth study of relatively focused areas, the tendency toward small-scale research and the generation of detailed descriptions mean that qualitative research scores well in terms of the way it deals with complex social situations.

Presenting and reporting the results

As with the stage of planning data analysis, the prepared researcher needs to consider the form of the reporting of the research and its results, giving due attention to the needs of different audiences (for example, an academic audience may require different contents from a lay audience). Decisions here need to be considered:

- How to write up and report the research?
- When to write up and report the research (e.g. ongoing or summative)?
- How to present the results in tabular or written-out form?
- How to present the results in non-verbal forms?
- To whom to report (the necessary and possible audiences of the research)?
- How frequently to report?

Vital information to be included when writing up research
There is some general consensus that when writing up research the aim is to:

1. Explain the purpose of the research.
2. Describe how the research was done.
3. Present the findings from the research.
4. Discuss and analyse the findings.
5. Reach conclusions.

Conclusion

The planning of research begins with the identification of purposes and constraints. With these in mind, the researcher can now decide on a research design and strategy that will provide the researcher with answers to specific research questions. These in turn will serve more general research purposes and aims. Both the novice and experienced researcher alike have to confront the necessity of having a clear plan of action if the research is to have momentum and purpose. The research design must suit the purposes of the research. If the reader is left feeling, at the end that the task of research is complex, then that is an important message, for rigour and thoughtful, thorough planning are necessary if the research is to be worthwhile and effective.

Some golden rules

1. Guide the reader through your discussion.
2. Be concise as far as this is compatible with clarity.
3. Don't waffle or digress.
4. Don't present raw data or theoretical principles en bloc without indicating their relevance.
5. Define your objectives.
6. Cover your back (Don't make yourself vulnerable to attack on issues which are not crucial to your argument).
7. Be honest with yourself as well as with your reader.
8. Don't draw conclusions, which are not justified by our evidence.
9. Acknowledge your sources.
10. Don't blind the reader with your eloquence.

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