Research provides knowledge and skill which is needed to help us in making decisions in various contexts. The term ‘research’, however, is usually used in terms of data collection. Politicians claimed they draft policies based on research, while businessmen advertise research results to convince consumers about the products they are selling.

In research, data collection is important for the future direction of the researcher or certain organisations/institutions and people who have an interest, who sponsored the study. In educational research, for example, educational problems are studied by teachers to find solutions, explanations or new knowledge which can help them improve their performance and that of their students.

Research data is collected through various ways and sources, which in the end is summarised in one well-supported research paper. However, if the data cannot be interpreted properly, it is not considered a research. In short, research data must be collected and interpreted systematically based on a clear purpose. Hence, analysis can be defined as a systematic scientific approach to a research on certain/several problems. In this case, systematic or scientific approach means the research is carried out logically and not merely be based on beliefs which have no concrete proof. The relationship between logic and systematic involves explaining the collection method and data analysis, provides a correct definition of the study’s result, explains the results obtained and also any limitations that may have affected it.
1.1 WHY RESEARCH?

Basically, research is carried out to systematically collected information as a step to solve a certain problem. The purpose of research can be classified as follows:

(a) Reporting/Exploration

This is the main aim of a research. It is carried out to collect primary data or background. In reporting/exploration, the information or statistics summary given do not give an inference or conclusion. There are those who do not view reporting as a research, but only as part of a research, if the report is done in detail.

(b) Descriptive

This type of research answers the questions on who, what, where, when and sometimes how. Its purpose is to explain a subject usually by preparing a profile of problems, people or events. This type of research may not be able to produce a strong inference. Even then, it is popular because it can be used besides being easy to use for the purposes of planning, monitoring and evaluating.

(b) Explanatory

This type of research answers on how and why. It is more explanatory and describes why certain phenomenon occur, whereas descriptive research only observes.

(b) Predictive

This type of research finds out when and in what situation a phenomenon most likely would occur. The ability to predict time and situation allows more control over the phenomenon.

Figure 1.1: Purpose of carrying out an analysis
A research project can be placed in a continuum based on the purpose and context of the research. On one end, the research is carried out merely to improve the understanding of available theories or by creating new theories without taking into consideration applications of research findings. This type of research is generally known as basic research or pure research. **Basic research** develops the principle knowledge of global socialism. It is also the source of most of the world’s scientific ideas and thoughts.

On the other end, there is also another form of research whereby its results are used to solve daily problems. This is known as **applied research**. Applied researchers use their knowledge to answer questions or solve daily problems, such as questions regarding policies or solutions to social, education or business problems.

**EXERCISE 1.1**

What is the main difference between basic research and applied research?

**1.2 RESEARCH IN EDUCATION**

**SELF-CHECK 1.1**

1. What is the relationship between teachers and research in an educational context?

2. Why do teachers need to do research?

3. How does research allow teachers to evaluate and improve their teaching practices?

If we do not face problems, whatever knowledge we have will become stagnant and not change. Knowledge, information and solutions to every problem are easily obtained. We do not have to question the authenticity, the presumption or its true meaning. In reality, the answers to the problems we are facing cannot be obtained so easily, because there is a gap between our personal knowledge as
opposed to general knowledge, besides general knowledge itself. At the workplace, for example, we constantly face work-related problems which are not easily solved. We are challenged to reflect presumptions, morals and practices; question and find methods to improve our work processes so that we make a decision based on correct information, and hence, enable us to improve our professional practices.

Teachers, like other professional groups, are said to face complex challenges which are socio-cultural dynamics, pedagogy, institutional setting, curricular policies and so on. Such situations force them to adapt and think ahead in carrying out their duties. Hence, it is clear that teachers need to do research, by systematically inquiring about problems and issues which they have identified regarding their duties. Basically, they need to obtain knowledge already existing in the field of education and also from other disciplines such as sociology, psychology, anthropology and philosophy (Freebody, 2003).

1.2.1 Qualitative and Quantitative Research

Teachers can carry out several analyses to tackle the practical problems they face. Each research has its own aim and method. The following explains the basic issues which differentiate each method, while other topics in this module will give a deeper explanation.

Quantitative analysis is a form of positivist inquiry which stresses on obtaining facts through measuring objectives and numeric data statistical analysis to understand and explain a phenomenon which can be used as a guide for policies and practices. (Ary, Jacobs & Razavieh, 2002; Brown & Dowling, 1998). The benefits of this analysis is based on the relevant theoretical framework. Besides that, numeric data further convinces researchers and users about the coherent theoretical phenomenon and quantitative reasoning which is assumed to be more credible and authentic.

However, such analysis has its weakness, which is that quantification alone cannot fully explain most of the problems in education. How do we quantify “things” such feelings, calmness and hidden intentions? As stated by Ary et al. (1998: 22), to study a violent student in school, for example, the researcher should study rather than report the types and number of incidents. The researcher should observe and interview violent students and try find the reasons for their violence, as well as ask them questions such as: “What are the students’ perceptions of their teachers and other students in school?”,” “How do other students react towards them?” and “How do teachers handle violent behaviour?”. Such questions need to be answered in a qualitative form, which is
to focus to the understanding of social phenomenon from the perspective of the participants to the research.

**Qualitative analysis**, as explained by Brown and Dowling (1998), is a research which stresses on the production of meaning. It is different from merely relying on facts, tests and samples, and research subject; qualitative research takes into consideration that which is not touched on by qualitative research, which is a person’s subjective view, intended and unintended consequences, idiosyncrasies and others.

**Table 1.1: Differences between Quantitative and Qualitative Research**

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Quantitative</th>
<th>Qualitative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Analyse relationship, reason and consequence.</td>
<td>Understanding social phenomenon.</td>
</tr>
<tr>
<td>Design</td>
<td>Formed before the analysis is carried out.</td>
<td>Formed when analysis is carried out.</td>
</tr>
<tr>
<td>Approach</td>
<td>Deductive, tests theory.</td>
<td>Inductive, theory driven.</td>
</tr>
<tr>
<td>Tools</td>
<td>Uses standard tools.</td>
<td>Involves face-to-face interaction.</td>
</tr>
<tr>
<td>Samples</td>
<td>Uses big samples.</td>
<td>Uses small samples.</td>
</tr>
<tr>
<td>Analysis</td>
<td>Statistical analysis on numeric data.</td>
<td>Narrative descriptions and interpretations.</td>
</tr>
</tbody>
</table>

**Source:** Ary, Jacobs & Razavieh (2002). Introduction to Research in Education. 6th ed. Belmont CA: Wadsworth

### 1.2.2 Action Research

One form of education research which is often used nowadays is action research, which is a self-reflective inquiry that questions, criticises and theorises presumptions based on ideas, understanding and own research practices. As explained by McNiff (2002: 15):

Action research is a form of self-educational research. It is a practical way to evaluate your practices to see if the proper level has been achieved. If you are happy with this, you can explain how and why you feel that way and provide proof to support your claim. If one feels the practice needs attention, one can take steps to improve it and prove how much the practice has improved.
Action research is also used in other fields such as social research and management to improve professionalism. However, there is no one approach to action research as individual researchers will emphasise various aspects of research, such as technical aspects or values obtained from the study. Generally, researchers will go through the following basic steps:

1. Monitor current practices – Is there a gap between the current and the best practice?

2. Identify problems to investigate – Must explain things which are to be investigated when writing research questions, whether it is of a wide or narrow scope. Explain why you are interested in researching the problem you have identified.

3. Imagine ways you can move forward – Ask yourself how you can improve your practices.

4. Try using the solutions obtained and evaluate what happened – Collect proof and evidence in journals, diaries, notes, audio and visual record, surveys, behavioural scales and other.

5. Change practices based on response from step (4).

6. Continue monitoring practices.

7. Re-evaluate practices which were changed.

Figure 1.2: Basic steps in action research
Figure 1.2 above shows the seven basic steps in action research. Action research is not linear but involves a rotation process which creates a new rotation action research within a certain period of time. For research which takes more time, the researcher can break it into several groups whereby reports can be written in several different research papers.

Think of several research topics that you are interested in and list them on a piece of paper. Ask yourself why you are interested in these topics and how the research can help your students later.

The following are real education research topics that were carried out by graduate and post-graduate students from a local university, which you can use as a guide in selecting a research topic:

- Students response on feedback from teachers (Teh Yock Suak)
- Effectiveness of direct teaching paradigms from inference teaching (Ellen Drabble)
- The use of motivational techniques to improve reading skills (Puteri Rohani Megat Abdul Rahim)
- Trainee teachers’ metacognitive knowledge structure: A case study (Ranjit Singh Gill)
- The use of CIS strategy on university management and UIS formulation (Qiang Qian)

Samples of Published Research Papers


This paper explains how the approach of an action research helps participants in improving their practice and cooperation. The process of making reflexes and studying together in this project help participants to think, learn, design, show and change their practice elements based on evidence collected. The main element in this paper is how the ‘in action’ and ‘on action’ (Schön) reflexes help
participants from different backgrounds to understand and improve their practices by increasing knowledge and self-confidence, as well as their own knowledge from other peoples’ perspectives.


This paper reports on action research projects regarding the second language teaching assessment. The research is based on *Cambridge Certificate in English Language Teaching to Adults* (CELTA) and focuses on how assessment criteria is done and carried out by teachers in New Zealand. The research findings show how several criteria are overgeneralised or overlap other criteria, which creates problems as to their reliability. This paper suggests several ways how the criteria can be modified. Issues raised are important for English teachers, or, to further generalise, teachers of a second language.


The situation in China today needs a holistic approach on education. In a seminar in Changchun, senior administrators suggested that Students’ Service Offices be set up in primary schools. The research looks at 19 action programmes by educationalists in North East China who proposed the goals of this office. The research findings show there is literature about guidance programme models to help academic development, career and personal/social needs of the students. Besides that, educationalists are of the opinion that the goals for the office needs to include helping teachers solve personal and work-related problems. Implications relating to international research and proposals to study counselling programmes were also produced.


This paper tries to answer questions on what is a specific action which a teacher should take to create an inquisitive culture in mathematics classrooms in secondary schools. Socio-cultural study theories are used as the framework analysing teaching and studying practices in a classroom over a span of two years. The Zone of Proximal Development (ZPD) concept is used as a basic framework to explain learning as “increasing participation in a community which adopts inquiring in mathematics.”
Analysis is based on observation in classrooms and interviews with students and teachers to show how teachers determine the norm and practices which focus on understanding mathematics and justification of ideas and submissions as well as to instil learning practices which students use as a response towards this inquiry method.

### 1.3 SCIENTIFIC INQUIRY METHOD IN RESEARCH

The aim of science is to expand knowledge and seek the truth. Researchers try to achieve this aim through theories and hypotheses. Predicting and understanding are among the two reasons we use theories. To predict, we need to know and understand related variables which need theories. Theories are statements that explain the relationship between variables in a phenomena as well as its causes and effects. Scientific methods are a series of steps used to develop and substantiate a theory.

Scientific methods and thinking really depend on concepts that enable us to understand something and think about it, as well as communicate with others in an abstract manner. The highest concept is used to explain certain things more specifically those that cannot be observed directly. Concepts and structures are used at the theoretical stage, while variables are used at the empirical stage.

Scientific research process is used to build and test various hypotheses through inductive-deductive thinking. Scientific research uses certain processes which combine inductive and deductive thinking as well as perception and hypothesis testing to activities that are based on reflective thinking. Everyone will analyse the same problem differently depending on individual perceptions and environments. Hence, the type of questions raised would be different based on one’s understanding about a phenomenon. It must be remembered, that scientific inquiry is one of the problem analysis method, but there are also other methods used to solve our problems.

What is science? Science is a system which builds knowledge. For most people, a picture/image of science can be perceived through its two classifications which is physical science (mathematics, physics, chemistry, biology) and social science (psychology, sociology, economy). Science subjects will determine the technique and equipment used in a research. The main aim of science is to produce an authentic generalisation and to find the relationship between several variables.
By understanding this relationship, the researcher will be able to understand the phenomenon analysed, create a prediction and determine causal relationships. Science has the following characteristics:

<table>
<thead>
<tr>
<th>Characteristics of Science</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Empirical</strong></td>
</tr>
<tr>
<td>Empirical data is obtained based on certain situations.</td>
</tr>
<tr>
<td><strong>Replicable</strong></td>
</tr>
<tr>
<td>Research can be repeated based on conditions, samples and methods which were previously used.</td>
</tr>
<tr>
<td><strong>Analytical</strong></td>
</tr>
<tr>
<td>This follows scientific method to understand and explain an empirical fact.</td>
</tr>
<tr>
<td><strong>Theory-based</strong></td>
</tr>
<tr>
<td>Depends on past knowledge.</td>
</tr>
<tr>
<td><strong>Logical</strong></td>
</tr>
<tr>
<td>Assumptions are made based on logic and research findings.</td>
</tr>
<tr>
<td><strong>Detail</strong></td>
</tr>
<tr>
<td>Efforts are made to reduce mistakes.</td>
</tr>
</tbody>
</table>

**1.4 AN ALTERNATIVE TO SCIENCE IN CREATING KNOWLEDGE**

“*If I always lose in a tennis game, I will keep playing and the chances of me winning would be higher.*” Is there anything wrong with this logic? Explain.

Information and knowledge can come from various sources besides science. Most of what we know are from what our parents taught us, what we have experienced, what we read in books or what we watched on TV or movies. Knowledge from these sources is usually enough for our daily interaction, but may have mistakes, just as scientific research which creates and uses correct knowledge only for a certain time or context.

(a) **Authority**
Knowledge obtained from our parents, teachers, experts as well as books and media are usually accepted as correct. Relying on authorities to obtain knowledge has benefits especially as it is convenient and fast. However, it has certain limitations because experts may not know as much as is
expected. They may give wrong information or knowledge because there are also experts who have certain unprofessional intentions of intentionally giving wrong information to expand their biased ideas.

(b) **Tradition**
Knowledge based on tradition is usually accepted as correct because it has passed the test of time and hence is reliable. What is not often mentioned is that knowledge passed from generation to generation may be based on irrational prejudices, which causes knowledge to be “natural” or may have changed every time it was passed down to a new generation.

(c) **Common Sense**
Information and knowledge can also be found in what is already known by those who believe in it. Common sense is important in our daily lives, but it may allow illogical thinking to affect our minds. It can also spread the wrong ideas which we are not aware of and cause us to accept the wrong information.

(d) **Media**
TV, movies, newspapers, magazines and other media are important sources of information for us. However, what they are feeding us may not be true and this may cause misreporting which may be a result of lack of knowledge or dependence on authorities, tradition or general knowledge as a source of information.

(e) **Personal Experience**
When something happens, we can feel, experience and accept it as reality. Our personal experience is an important source of knowledge, but it could also distort our thinking. What we feel is true, may be a mistake or based on distorted perception/decision. Personal experience is strengthened through four main mistakes:

- **Overgeneralisation**: When we have proof that causes us to believe, we presume the matter is real in other situations.

- **Selective Perception**: When we focus on certain things and not on others. This focus is even stronger if it is in line with what we have preconceived.

- **Premature Closure**: When we make decisions feeling we have all the answers we need and feel we no longer need to hear the opinions of others, to find other information or to raise other questions.
• **Halo Effect**: When we overgeneralise an object or person with excellent characteristics, it causes us to highly overrate the object or person.

### 1.5 Benefits of a Scientific Approach

A critical factor that differentiates research which uses a scientific approach from that which uses other sources of knowledge is that scientific knowledge is more based on collection and analysis of data. A scientific approach is based on two important aspects: **logic** and **observation** (Figure 1.3). These are two important aspects which relate to three main elements in a scientific approach, which are scientific theory, data collection and data analysis.

![Figure 1.3: Scientific approach](image)

#### 1.5.1 Traditional Science Model

In a traditional science model, there are three important elements:

(a) **Theory** – used to work on ideas that are produced hypothetically.

(b) **Operationalisation** – states the meaning for variables involved and how they can be measured. It is a process to state operational definitions or to state detailed operations to measure change.
(c) **Observation** – to see and measure what can be seen. Observation is used to prove a hypothesis or vice versa.

### 1.5.2 Deductive and Inductive Model

Research involves the use of theories. When we form an analysis, the theory may or may not be stated explicitly even though it needs to be when we present the result and summary of the research.

- **Inductive Model** – moves from specific to general, from a set of specific observations to discovery of patterns which have an arrangement. In this model, the general principles are formed from specific observation.

- **Deductive Model** – moves from general to specific. From a certain form which is assumed to be logic- or theory-based to observations which test whether the assumed form really exists. In this model, a certain hypothesis is built based on general principles.

![Figure 1.4: The relationship between inductive and deductive model](image)

### 1.6 GOOD RESEARCH CRITERIA

Useful and reliable knowledge can only be obtained through planned, executed and tested research. Good research has the following scientific features:

- **Purpose of a Clear Research**
  The reason or purpose for conducting research must be clearly stated to avoid confusion. Its purpose may test a hypothesis to solve a set of
problems or to find general principles, or to interpret behaviour which can be used to explain, predict or control events in a certain situation. Hence, researchers must state the purpose for the research clearly in writing, including the scope and limitations of the research as well as the accurate definition in main terms used.

(b) **Clear Explanation of Research Process**
The research process must be explained in detail so that it can be repeated and certified by other researches. The source of literature and data, and methods used to collect data must be stated explicitly, except confidential sources. If the source and/or methods are not stated clearly, the question of reliability would surface.

(c) **Systematic Planning and Execution**
The research process must be carefully planned to reduce errors. If primary data is used, research samples must be explained and proof of representation shown. Efforts must be made to curb researchers’ influences and biasness in choosing and recording of data.

(d) **High Ethical Standards**
A research process which gives priority to control the research participants from harm or prejudice, and at the same time produce quality results with higher value. Ethical aspects are discussed at length later.

(e) **Detailed Discussion of Findings**
Researchers need to use appropriate data analysis method and the analysis must be made in detail. Besides that, data credibility and authenticity must be checked and validated; the research findings must be explained clearly. If the statistics test is used, the researcher must state the significance of the possibility and error margin used. The delivery of the research findings must be made within limits, clearly, correctly, wholly and easily understandable besides being arranged to enable easy reading. Any generalisation which supercedes proof will invite the wrong impression.

(f) **Research Limitations Must Be Stated Clearly**
Because each research has its limitation, researchers must state these or errors which occur in carrying out the study, which can effect its findings. However, some limitations do not affect the findings, but there are some which can affect the entire research. If the researcher states that the research has no limitations, it may be questioned.
ACTIVITY 1.1

Which of the above research criteria do you feel is important? Why?

EXERCISE 1.2

Mark (C) if correct or (W) if wrong.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Correct/Wrong</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. In deduction, we begin from data observation, creating a generalisation and explaining the relationship between the variables observed.</td>
<td></td>
</tr>
<tr>
<td>2. Theories help us to understand what we have observed.</td>
<td></td>
</tr>
<tr>
<td>3. Traditional science models use inductive logic.</td>
<td></td>
</tr>
<tr>
<td>4. A good hypothesis is one that can be tested.</td>
<td></td>
</tr>
<tr>
<td>5. The role of a theory is representation, while for model is explanation.</td>
<td></td>
</tr>
<tr>
<td>6. In deduction, we begin from observing data, creating a generalisation and explaining the relationship between the variables observed.</td>
<td></td>
</tr>
</tbody>
</table>

WEBSITE

Visit the following website to obtain more information about research.
http://www.support4learning.com/education/research.htm
1.7 RESEARCH ETHICS

Ethics are norms which direct us to make a choice, behave and/or contact with others. In research, ethics refer to a researcher’s appropriate behaviour towards those who are affected directly or indirectly by the research. The researcher must pay attention to the seriousness of ethical-related problems which may occur. Basically, as stated by McNamee (2002), research subjects (for example a group of government school students) have the right to know about the type and purpose of research and if they are willing to participate or not. Ethical problems can arise in various sources, which are identified by Cohen et al. (2000), to include:

- Types of research projects;
- Research context;
- Procedures to be used;
- Data collection methods;
- Types of participants;
- Types of data collected; and
- The use data practical collected.

Among the ethical issues include:

- Confidentiality of research participants;
- Voluntary participation and volunteers’ rights to withdraw from participating in the research partly or wholly;
- Permission and probability of cheating among the participants;
- Protecting confidentiality of data from individuals who can be identified;
- Participants’ reactions towards the research method, analysis and reporting of findings; and
- Behaviour and objectivity of researchers.

During the early stages of the research, the researcher must obtain permission to get materials from related agencies, organisations and individuals. Ethical problems may arise if the authorising bodies do not give sufficient explanation or if a participant is not clear as to the objectives of the research. Issues relating to privacy may arise, for example, when researchers accidentally or intentionally intrude on the privacy of future participants or information providers, by calling at an inappropriate time.
Obtaining secondary data can also create ethical problems, for example, when the researcher takes personal data of an individual who refused to participate in the research project. Figure 1.5 shows an example of research policies.

1.1. The *Australian National University* (hereinafter known as "University") is responsible to abide by high research integrity standards and to ensure researchers show high professional ethical standards. Researchers have the responsibility to ensure their work helps in driving their profession and also at the University they serve.

1.2. This policy explains the standards to everyone handling the research in the University, including staff, graduate and post graduate students and even academic visitors to the University. It also give a framework which will protect researchers from the possibility of misunderstanding and also provide steps to follow if there is any suspicion or accusations of wrongful research. All questions regarding the policies must be directed to the Vice Chancellor (Research).

1.3. General principals guiding research have been long amended. One of the more important principals is to uphold ethical standards as well as validity and accuracy in collecting and reporting data. The researcher’s responsibility is to achieve and maintain high intellectual standards when carrying out the research.

1.4. Research community responsibility to the public and itself must be appreciated. This responsibility is even more important if professional practices or general policies are defined or changed based on the research findings.

1.5. Research process will control the truth. Communication among fellow researchers; maintaining and referring research records; delivering and discussing work in meetings with experts, result publication, including checks; and research repetition or continuation by other researchers; all these contribute to improving and upgrading research ethics.
1.6. Competitive research can have a strong or positive effect, help improve the quality as well as maintain and bring about faster research findings. However, pressure from the competition can threaten a good research practice, if it causes preparation and delivery of report be made in haste, or the research report is divided into several small questions to increase publication, or to place too much importance on safety so much so that it causes the research to become unimpressive, without utilising creativity or innovation.

1.7. When we interpret this policy, the nature of a discipline must be considered.

1.8. The researcher must understand this policy and ensure the provisions are followed. Failure to do so can result in disciplinary action.

Figure 1.5: An example of policies document “A Good Research Practice”

ACTIVITY 1.2

Suggest responsible educational research ethics and institutional decision-makers.

SUMMARY

It is often said that the only way to learn about research is by conducting it yourself. There is no denying that this is true, but as Bell (1999) and others said, it is a waste of time if basic research procedures are not followed. In this topic, we have seen several types of different researches all with the same aim, that is to test what we know and create new knowledge or a new way to see the world. A good research has the same characteristics, which include being systematic, having a clear scope, following high ethical standards and stating its limitations.
### KEY TERMS

- Basic research
- Applied research
- Quantitative research
- Qualitative research
- Action research

### SELF-TEST 1

1. Briefly state the difference between basic research and applied research.

2. Briefly explain why action research is important to teachers.

3. One good research characteristic is “Stating the research limitation clearly”. Briefly explain what this characteristic means.

### SELF-TEST 2

Research can be done either using Inductive or Deductive Models.

1. Explain what you understand about Inductive Models and state how you can use this model in your research.

2. Explain what you understand about Deductive Models and state how you can use this model in your research.

3. Give an example of action research which can be done using Deductive Models.