

**HQOE 1
FUNDAMENTALS OF
CURRICULUM,
INSTRUCTION AND
RESEARCH IN
EDUCATION**

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Chapter 1 ▶ Introduction to Curriculum

CHAPTER LEARNING OUTCOMES

By the end of this chapter, you be able to:

1. Define what is a curriculum;
2. Compare the various definitions of curriculum proposed by different scholars;
3. Explain what is the hidden curriculum;
4. Differentiate between the three approaches to curriculum;
5. Identify the foundations of curriculum;
6. Discuss the connection between curriculum and instruction;
7. Briefly describe the curriculum development process; and
8. Argue whether curriculum is a discipline.

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► INTRODUCTION

NEWS PAPER HEADLINES

- “Homework should be made more meaningful”
- “Students can’t read properly after 11 years of schooling”
- “Students are bored with studying the same thing each year”
- “Teachers are unable to complete the syllabuses because too much time is spent on co-curricular activities”
- “Teachers are reluctant to teach beyond what is in the curriculum, considering it a waste of time”
- “Thinking skills of students need to be developed”
- “Parents passing the responsibility of educating their children to teachers”
- “Sports is being neglected in schools”
- “Environmental education should be taught”



You would have probably come across these headlines in newspapers and magazines. These headlines are an indication of society’s concern with what is going on in schools and in particular the curriculum. It should be remembered that a curriculum is a contract between society and those in power stating how its

next generation of young people will be educated. Hence the general public have a right to question how schools are preparing its next generation of citizens.

As society becomes more educated, more of its members are keen in expressing their views on various issues regarding what are schools doing and what is taught in schools. Sometimes it is tempting to ask whether society ever come to a consensus on what it wants schools to do.

Some sectors of the population are demanding that schools teach for the mastery of the facts, concepts and principles of a discipline, while others are calling for reducing content and placing more emphasis on the development of critical and creative thinking. Still others feel that schools are not paying enough attention towards developing the character of students. It appears that society is in a state of confusion not knowing what it wants of its schools. However, what may be defined as confusion is in reality dynamism because curriculum is a reflection of our values, choices and perspectives in differing contexts. As society changes so will the curriculum because it is a reflection of society at a particular point in time. For example, during colonial times, education in Malaysia was confined to producing clerks and office assistants for the English administrative system.

Whether we consider curriculum narrowly as a listing of subjects to be taught in schools or broadly as all learning experiences that individuals acquire while in school, there is no denying that curriculum affects us all. Curriculum is the concern of everyone, whether they are teachers, academics, students, parents, politicians, businessmen, professionals, government officials or the person on the street.



Activity 1.1

1. Discuss any 3 headlines listed above that you agree with. Why?
2. Locate and report other concerns about the curriculum that you have you come across?

1.1 DEFINITIONS OF CURRICULUM



Just like most things in education, there is no agreed upon definition of 'curriculum'. The word originates from the Latin word *currere* referring to the oval track upon which Roman chariots raced (see picture). The New International Dictionary defines **curriculum** as *the whole body of a course in an educational institution or by a department* while The Oxford English Dictionary defines curriculum as *courses taught in schools or universities*. Curriculum means different things to different people. Most people, including educators equate curriculum with the syllabus (*Do you agree?*) while a few regard curriculum as all the teaching-learning experiences a student encounters while in school. Since the early 20th century when Franklin Bobbitt dubbed the *Father of Curriculum* wrote his book *The Curriculum* in 1918, various theoreticians and practitioners have proposed definitions of curriculum.

Tanner (1980) defined curriculum as "the planned and guided learning experiences and intended outcomes, formulated through the systematic reconstruction of knowledge and experiences under the auspices of the school, for the learners' continuous and wilful growth in personal social competence" (p.13).

- Schubert (1987) defines curriculum as the contents of a subject, concepts and tasks to be acquired, planned activities, the desired learning outcomes and experiences, product of culture and an agenda to reform society.
- Pratt (1980) defines curriculum as a written document that systematically describes goals planned, objectives, content, learning activities, evaluation procedures and so forth.

- Goodlad and Su (1992) define curriculum as a plan that consists of learning opportunities for a specific time frame and place, a tool that aims to bring about behaviour changes in students as a result of planned activities and includes all learning experiences received by students with the guidance of the school.
- Cronbleth (1992) defines curriculum as answering three questions: what knowledge, skills and values are most worthwhile? Why are they most worthwhile? How should the young acquire them?

Summary of Various Interpretations of Curriculum

Curriculum is:

- that which is taught in school
- a set of subjects
- content
- a programme of studies
- a set of materials
- sequence of courses
- a set of performance objectives
- a course of study
- everything that goes on within a school
- everything that is planned by school personnel
- that which is taught both inside and outside of school directed by the school
- a series of experiences undergone by learners in school
- that which an individual learner experiences as a result of schooling

[Source: Peter F. Oliva, *Developing the Curriculum*. Boston: Little, Brown & Company. 1982. p. 5]

- Grundy (1987) defines curriculum as a programme of activities (by teachers and pupils) designed so that pupils will attain so far as possible certain educational and other schooling ends or objectives.
- Hass (1987) provides a broader definition, stating that a curriculum includes “all of the experiences that individual learners have in a program of education whose purpose is to achieve broad goals and related specific objectives, which is planned in terms of a framework of theory and research or past and present professional practice” (p.5).



Self Check 1.1

1. Identify the FIVE common features of a curriculum mentioned in most of the definitions given by scholars in the field (exclude Peter Oliva).
2. Select SIX interpretations of the curriculum summarised by Peter Oliva which you think gives a comprehensive definition of curriculum.

Are you confused with the different definitions? Well, don't be! It is not necessarily a bad thing having numerous definitions of curriculum. The variety of definitions demonstrates the dynamism of the field because it reflects the philosophical beliefs, conceptions of human learning, pedagogical strategies, political experiences and cultural background of the society the curriculum is planned for (Ornstein and Hunkins, 1998). Though much time may be spent on defining curriculum, it may be time well spent because it encourages exploration of many possibilities. One should be aware that if a curriculum is too narrowly defined there is the tendency and likelihood to omit, ignore or miss relevant factors related to teaching and learning because they are not part of the written plan. On the other hand, if they are too broadly defined, it would difficult to implement because it may be open to different interpretations. This will make the task of evaluating achievement of the goals and objectives of the programme more difficult. Despite varying definitions of curriculum, there seems to be a consensus that it is a statement:

- of what students should know (knowledge or content),
- be able to do (skills),
- how it is taught (instruction),
- how it is measured (assessment), and
- and how the educational system is organised (context).

It is a structured plan of intended learning outcomes, involving knowledge, skills, behaviour and associated learning experiences organised as a sequence of events that a student acquires through education and training. How we conceive of the curriculum is important because our conceptions and ways of reasoning about curriculum reflect how we think, study and act on the education made available to students. In short, how we define the curriculum reflects our assumptions about the world (Cornbleth, 1990).

1.2 THE HIDDEN CURRICULUM

You may have heard of the phrase “hidden curriculum”. What is it? The phrase hidden curriculum was coined by the sociologist Philip Jackson in his book *Life in Classrooms* written in 1968. He drew attention to the idea that schools did more than simply transmit knowledge from one generation to another. Students learn things that are not actually taught in the formal curriculum. It could be viewed as the entire range of educational experiences promoted by schools and teachers through practices that are not necessarily written down.

As pointed out by Doll (1992), “every school has a planned, formal acknowledged curriculum, but there is also has an unplanned informal and hidden one that must be considered” (p.5). The planned, formal curriculum focuses on goals, objectives, subject matter and organisation of instruction. The unplanned, informal curriculum deals with socio-psychological interaction among students, teachers and administrators, especially in relation to their feelings, attitudes and behaviours

If we only consider the planned curriculum, the official curriculum stated in a written document, we ignore both the numerous positive and negative consequences that can result from the planned curriculum. Oftentimes, we fail to realise the power of the hidden curriculum, which may not be written but will certainly be learned by students. For example, they learn even without being formally taught:

- about “the rules of the game” in the school canteen, in the playground, in the corridors of the school and so forth,
- the specific relationships between senior and junior students, between male and female students, cliques of students,
- how order is created and maintained in the classroom, the way individual teachers interpret the behaviour of students, and
- the way teachers and principals or headmaster have different expectations of students based on interpretations of behaviour in class.

The hidden curriculum involves learning such things as how to respond to and cope with authority, how to get on with others, how to pass the time, how deal with boredom, how to establish priorities and how to conform to the expectations of teachers and their peers.



Self Check 1.2

1. What is the hidden curriculum?
2. Why is the hidden curriculum important in education?
3. Give examples of the hidden curriculum other than those stated in the text.

1.3 CURRICULUM APPROACHES

If you examine the definitions provided by the experts in the field, there are three ways of approaching a curriculum (see Figure 1.1). First is to approach it as *content* or a body of knowledge to be transmitted. Second is to approach it as a *product* or the learning outcomes desired of learners. Third, is to approach it as a *process* or what actually happens in the classroom when the curriculum is practiced.

1.3.1 Curriculum as Content

It is quite common for people to equate a curriculum with the *syllabus* which is a concise document listing the topics of a subject. If you have experience in preparing students for national examinations, you will be familiar with such documents. What do they contain? Perhaps, a list of topics, the concepts to be mastered and some suggestions on how the topics are to be taught. For example, a primary school mathematics curriculum will consist of topics on addition, multiplication, subtraction, division, distance, weight and so forth. A syllabus will not generally indicate the relative importance of the topics or the order in which they are to be studied. But, there is tendency for teachers to follow the sequence prescribed in the syllabus. In most cases teachers follow the logical structure of selected textbooks simply because the textbooks have been written to match closely the syllabus. For example, in secondary school geography involving the study of countries or regions, textbooks tend to begin with physical geography such as relief, climate, vegetation followed by economic activities such as agriculture, mining, industries, urbanization and so forth.

It has been suggested that if one adopts the content approach to curriculum, focus will be on the syllabus and the body of knowledge to be transmitted or 'delivered' to students using appropriate teaching methods. When curriculum is equated with content, there is the likelihood to limit instruction to the acquisition of facts, concepts and principles of the subject matter transmitted.

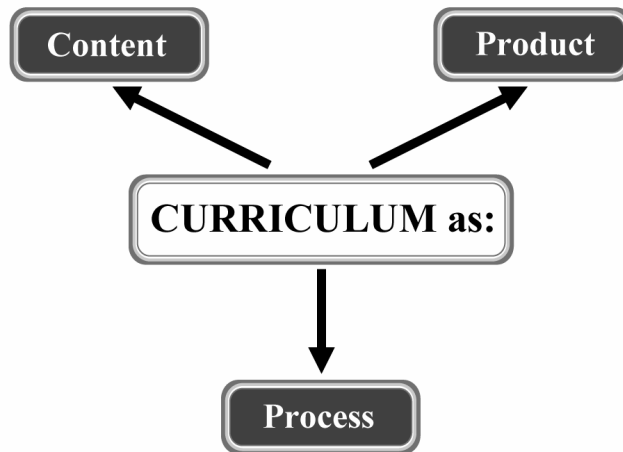


Figure 1.1: Approaches to curriculum



Self Check 1.3

1. What do you mean when *curriculum is approached as content*?
2. Why is it a common approach of viewing curriculum?

1.3.2 Curriculum as Product

Besides viewing curriculum as content that is to be transmitted, it has also been viewed as a *product*. In other words, what is it that is desired of students having been taught using a curriculum. Franklin Bobbitt (1918) in his book *The Curriculum*, stated that;

Human life, however varied, consists in the performance of specific activities. Education that prepares for life is one that prepares definitely and adequately for these specific activities. However numerous and diverse they may be for any social class they can be discovered. This requires only that one go out into the world of affairs and discover the particulars of which their affairs consist. These will show the abilities, attitudes, habits, appreciations and forms of knowledge that men need.

These will be the objectives of the curriculum. They will be numerous, definite and particularised. The curriculum will then be that series of experiences which children and youth must have by way of obtaining those objectives. (p: 42).

According to Bobbitt, education should prepare people for life with detailed attention to what people need to know in order to work and live their lives. Go out into the world and see for yourselves what society needs (*“the abilities, attitudes, habits, appreciations and forms of knowledge that men [women] need”* according to Bobbitt). Curriculum should not to be the result of 'armchair speculation' but the result of systematic study of society. The product from the curriculum is a student equipped with the knowledge, skills and values to function effectively and efficiently. Ralph Tyler (1949) shares Bobbitt's approach to curriculum when he said that the real purpose of education is to bring about significant changes in students' pattern of behaviour [*We will examine Tyler's view in more detail in Chapter 5*]. It is important that any statement of objectives of the school should be a statement of changes to take place in the students. The attraction of this way of approaching curriculum is that it is systematic and has considerable organising power. Central to the approach is the formulation of behavioural objectives which provide a clear notion of outcomes or desired products so that content and teaching methods may be organised and the results evaluated.

In order to measure, things have to be broken down into smaller and smaller units (*“numerous, definite and particularise...series of experiences which children and youth must have”* according to Bobbitt). The result, as many of you will have experienced, can be long lists of often trivial skills or competencies. This can lead to a focus on the parts rather than the whole; on the trivial, rather than the significant. It can lead to an approach to education and assessment which resembles a shopping list. When all the items are ticked, the person has passed the course or has learnt something. The role of overall judgment is somehow sidelined.



Self Check 1.4

1. How is *curriculum as product* different from *curriculum as content*?
2. What should be the overall purpose of a curriculum according to Bobbitt and Tyler?
3. How are these objectives to be derived?



Activity 1.2

Criticisms of the “Curriculum as Product” Approach

There are a number of disagreements with the *Curriculum as product* approach. The first is that the curriculum can become too technical and sequential. The tendency is for the curriculum to exist prior to and outside the learning experiences which takes much away from learners and end up with little or no voice. They are told what they must learn and how they will do it. The success or failure of a curriculum is judged on the basis of whether pre-specified changes occur in the behaviour of learners. If the curriculum is closely followed it might limit creativity and turn educators into technicians.

Also, since the approach emphasises measurability, it implies that behaviour can be objectively, mechanistically measured. There are obvious dangers here; there always has to be some uncertainty about what is being measured. It is often very difficult to judge what the impact of particular experiences has been. Sometimes it is years after the event that we come to appreciate something of what has happened.

[Source: Smith, M. K. (1996, 2000) Curriculum theory and practice, *The Encyclopaedia of Informal Education*. www.infed.org/biblio/b-curric.htm.]

1. To what extent do you agree with the criticisms of the *curriculum as product* approach?
2. What are some advantages of this approach?

1.3.3 Curriculum as Process

We have seen that the *curriculum as content* approach emphasises the content to be transmitted while *curriculum as product* approach is focussed on the setting of instructional or behavioural objectives. Another way of looking at curriculum is via process. Here, curriculum is not seen as a physical thing, but rather the interaction of teachers, students and knowledge. It is what actually happens in the classroom such as the questions asked by the teacher, the learning activities students engage in and so forth. It is an active process with emphasis on the context in which the processes occurs. Stenhouse (1975), used the analogy of the a recipe in a cookbook which teachers translate into practice in the classroom. Like a recipe it can be varied according to taste. So can a curriculum.

According to the process approach curriculum is seen as a scheme about the practice of teaching. It is not a package of materials or a syllabus of content to be covered. The classroom is seen as a laboratory in which the teacher is like a scientist who tests the ideas stated in the curriculum. The teacher translates an educational idea into a hypothesis that is tested in the classroom. It involves critical testing rather than acceptance. The focus is on finding out those processes which enhance (if it is successful) or hinder (if it goes wrong) a person's learning. So, the curriculum is not a finished product but rather the proposed educational ideas that have to be verified in the classroom by teachers. So, you may not know what you are going to get and may differ from what has been specified in the curriculum document [*Life is like a box of chocolates, you never know what you're gonna get* – *Forest Gump*]. This differs from the product approach where the desired behaviours have been pre-determined or more or less fixed and applies to all learners.

The process approach to curriculum treats the learners are not as objects to be acted upon. They have a say in what is going on in the teaching-learning sessions. The focus is on interaction and attention shifts from teaching to learning. On the other hand, the product model, by having a pre-specified plan or programme, tends to direct attention to teaching. A process approach to curriculum theory and practice, as argued by Grundy (1987), tends towards making the process of learning the central concern of the teacher with emphasis on thinking and meaning-making.

1.4 FOUNDATIONS OF CURRICULUM

Debate is still continuing as to the definition of curriculum. Despite this lack of consensus, it has not hindered institutions, school districts, states and nations continually developing and improving curriculum in schools, colleges, universities and training organisations. Imagine what would have happened if we had to wait for an agreed upon definition of curriculum. The design and development of curriculum is a team effort involving curriculum planners, curriculum developers, teachers, academicians, education officers, administrators, community members and many others. They decide the goals of the curriculum, what content to include, how it should be organised, suggest how it should be taught and how to determine whether efforts have been successful. To help them make these decisions, they have turned to philosophy, psychology, sociology and history. These have been accepted as the foundations of a curriculum [*We shall discuss the influence of these disciplines in detail in Chapters 2, 3 and 4 respectively*].

These disciplines have produced a vast amount of knowledge that provide guidelines for people interested in developing curriculum. For example, from philosophy has evolved numerous beliefs as on how people should be educated and what knowledge is worthwhile. These beliefs have provided curriculum developers with guidelines on how they should go about designing curriculum. From psychology, various perspectives on how humans learn have been proposed. This knowledge is of great significance since a curriculum is a plan on what individuals are supposed to learn. Decades of research have provided insight into the human psyche which curriculum developers have tapped into to guide decisions on how a body of content is to be taught and acquired at different levels of human development. The disciplines of sociology, economics, culture, and politics provide an insight into society. A curriculum is a reflection of societal values and beliefs it serves. It is usually a response to what society wants and desires. [Refer to the newspaper headlines listed at the beginning of the chapter]. The community plays an important role in influencing what is taught in the classroom. Finally, many curriculum plans are an evolution from earlier times and curriculum developers refer to historical events to better understand the decisions made at different points of time. It provides a background for better understanding present day curriculum development efforts [We will examine the curriculum of early American and Japan in Chapter 4 to understand how and why curriculum changes with the evolution of society].



Activity 1.3

Problems with the “Curriculum as Process Approach”

- Teachers who want uniformity in what is taught will find this approach problematic because the focus is on the learner. So there will be different content and methods of delivery to cater to individual needs.
- Examinations would be difficult to conduct because learners would be learning different things and at a different pace. It would not be fair to have one examination as you might not be assessing the real ability of a learner.
- Examinations do not pay attention to the context in which learning takes place and so some students might be disadvantaged.
- Teachers implementing a curriculum using the process approach have to believe that learning is the making of meaning and construction of knowledge. If teachers are not convinced this should be the aim of education, then the process approach will not succeed.

1. To what extent do you agree with the problems with the “Curriculum as Process Approach”?
2. Do you think the *curriculum as process approach* would be easier to implement if there were no centrally controlled or national examinations?
3. What is the main difference between the *curriculum as product* and *curriculum as process* approach’?

[**Source:** Smith, M. K. (1996, 2000) Curriculum theory and practice, *The Encyclopaedia of Informal Education*.www.infed.org/biblio/b-urric.htm.]

1.5 CURRICULUM DEVELOPMENT

Curriculum development is a process involving many different people and procedures. Thus, it is usually linear and follows a logical step-by-step fashion involving the following phases: curriculum planning, curriculum design, curriculum implementation and curriculum evaluation. [*We will discuss each phase in detail in Chapter 5, 6, 7 and 8. If you were to specialise in curriculum, then each of these phases would be taught as a separate course by itself*]. The phases of the process provide us with guideposts and structure to clarify our thinking. The phases can be graphically or pictorially illustrated and are conceived in technical terms – with the assumption that one must be knowledgeable of the process to fully appreciate and understand. Don’t worry! By the end of Chapter 8, you will fully understand the technical terms associated with each of these phases of curriculum development.

Many curriculum development models have been proposed. Generally, most models involve four phases. First is, *curriculum planning* which involves decisions about the philosophy of education and the aims of education. Having decided on the philosophical beliefs, curriculum goals and objectives are derived which are later translated into the classroom as desired learning outcomes among students taught. The second phase is *curriculum design* which refers to the way curriculum is conceptualised and involves the selection and organisation of content, and the selection and organisation of learning experiences or activities. Among the issues that have to be resolved is deciding ‘what knowledge is of most worth’, ‘how should the content be organised to maximise learning’. The third phase is *curriculum implementation* in the classroom setting. It involves getting people to practice the ideas in the curriculum, providing them with the necessary resources, training and encouragement. The fourth phase is *curriculum evaluation* which is determining the extent to which the efforts in implementing the ideas of the curriculum have been

successful. It involves identification of factors that have hindered implementation as well as success stories; and most important whether students have benefited from the programme.

1.6 CURRICULUM AS A DISCIPLINE

Can curriculum be considered a discipline just like sociology, economics, biology or political science? Graduate students have been taking courses in curriculum planning, curriculum evaluation, primary school curriculum and so forth in various universities. Many graduate schools of education offer doctoral specialisations in curriculum and instruction, better known as 'C&I'. To arrive at a decision as to whether an area of study is a discipline, one must first ask the question, 'What are the characteristics of a discipline?'. If we know the characteristics of a discipline, then maybe we can decide if 'curriculum' is a discipline. According to Oliva (1982), a discipline has the following characteristics:

- A discipline should have an organised set of theoretical principles.
- A discipline encompasses a body of knowledge and skills pertinent to that discipline.
- A discipline has its theoreticians and its practitioners.

The field of curriculum has its set of *principles*. For example the term 'curriculum' itself is a concept describing very complex ideas. In curriculum planning there are principles such as educational philosophy, curriculum goals and learning objectives which are applied in developing programmes for school, universities and training centres. In curriculum design, the principles of scope, sequence and balance are used in the organisation of content to be taught. The field of curriculum has its own *body of knowledge and skills*, though much of it has been borrowed from a number of pure disciplines. For example, in the selection of content (What to teach?), curriculum has relied on the principles, knowledge and skills from psychology, philosophy and sociology. In the organisation of content, curriculum has drawn from the fields of management and organisational theory. In the implementation of curriculum, various ideas from systems theory, organisational behaviour and communication theory have been used to enhance effectiveness. For example, research in organisational behaviour has been used to bring about change among teachers, educational administrators and the community. Has the field of curriculum its own body of knowledge and skills? Applying the ideas drawn from the different disciplines and through experimentation it has generated its own body of knowledge and skills, or at least, new interpretations of principles as applied in the educational setting.

The field of curriculum has its list of *theoreticians and practitioners* and they include curriculum planners, professors of curriculum, curriculum developers and so forth who are termed as curriculum specialists. These specialists are well-versed in areas relating to curriculum, such as the history and origin of a curriculum (to know of earlier successes or failure), curriculum planning and how a particular curriculum is to be implemented in schools successfully. The specialist is well-informed about how students learn, how teachers react to change and obstacles to improvement. The curriculum specialist generates new knowledge by recombining existing programmes, adapting approaches and constructing new curriculum. [*Perhaps, after completing this course you might be more convinced that curriculum meets the requirement of a discipline or maybe not!*]



Self Check 1.5

1. Why do curriculum developers rely on the knowledge and skills of other discipline?
2. How would you justify the field of curriculum to be a discipline?

1.7 CURRICULUM AND INSTRUCTION

Now that you have an idea of what is a curriculum; what is the relationship between curriculum and instruction? Simply put, curriculum is *what* to be taught while instruction is *how* it is taught. The relationship between curriculum and instruction is a partnership. We may think of the curriculum as a plan stipulating the content to be taught along with the learning experiences to be included. Instruction may be thought of as methodology, the teaching act and assessing of achievement. In other words, it is putting into practice what has been planned.

Oliva (1982) described curriculum and instruction as two entities. You could have a situation in which the two entities are apart, called the *dualistic model* (see Figure 1.2a). What takes place in the classroom under the direction of the teacher has little relationship to what is stated in the curriculum plan. Planners ignore what teachers are doing and vice-versa. The curriculum or the instructional process may change without affecting one another. This separation will do serious harm to each other. On other occasions, curriculum and instruction are mutually interdependent as shown in the *concentric model* (see Figure 1.2b). In this model curriculum assumes the superordinate position while instruction is subordinate; that is, instruction is a subsystem of curriculum which is itself a subsystem of the whole system of education. This model implies a system that is

hierarchical, with curriculum dominating instruction. Instruction is not a separate entity but a very dependent portion of the curriculum entity. In other situations, curriculum and instruction may be separate entities with a continuing circular relationship, called the *circular model* (see Figure 1.2c). Curriculum makes a continuous impact on instruction and similarly instruction impacts on curriculum. This model assumes that instructional decisions are made after curriculum decisions are made. But, these curriculum decisions are later modified when they have been implemented and evaluated in the classroom. This process is continues, repeated and never-ending.

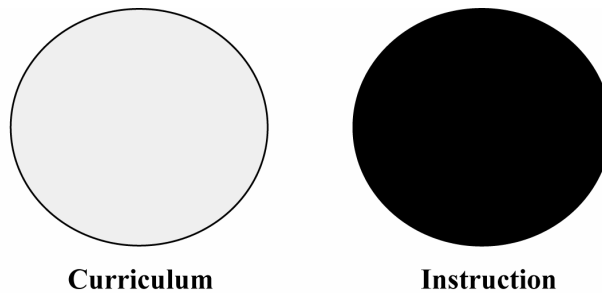


Figure: 1.2 a: Dualistic Model

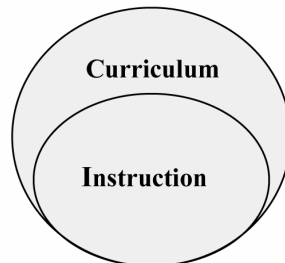


Figure: 1.2 b: Concentric Model

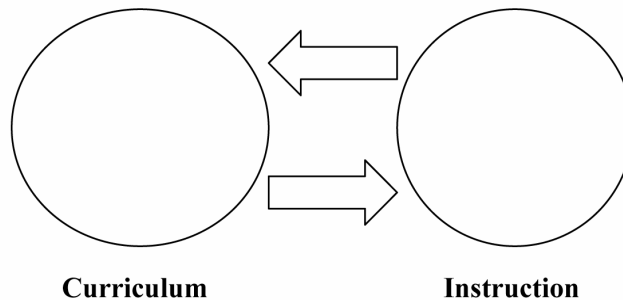


Figure: 1.2 c: Cyclical Model

Figure 1.2: Curriculum and instruction relationship

[Source: Peter Oliva, *Developing the curriculum*. 1982. Boston: Little Brown & Co. pp.12-13]

Of all the models, the cyclical model seems to be the best alternative as it emphasises the need for a close working relationship between implementers and planners. Though curriculum and instruction may be different entities they are interdependent and cannot function in isolation. It is impossible to plan everything that happens in the classroom in the curriculum document. It should be accepted that what is planned on paper may not work exactly because the numerous factors operating in the classroom are impossible to predetermine. The constant feedback from the classroom as to what works and what does not work has to be recycled to curriculum developers so necessary adjustments and modifications can be made to the curriculum plan. This may explain the need for pilot-testing a curriculum before it is widely implemented.

SUMMARY

- Curriculum is a statement of what students should know, be able to do, how it is taught, how it is measured, and how the educational system is organised.
- Curriculum can be approached as content (knowledge, skills and values), product (desired learning outcomes) and process (interactions in the classroom).
- Curriculum development is a process involving planning, designing, implementation and evaluation.
- Curriculum can be considered a discipline because it has an organised set of theoretical principles, it includes a body of knowledge and skills and has its theoreticians and its practitioners.
- The relationship between curriculum and instruction is interdependent, continuous, repeated and never-ending.

KEY TERMS

Curriculum

Curriculum as:

- content
- product
- process

Curriculum as a discipline

Curriculum development

Curriculum and instruction

- dualistic model
- concentric model
- cyclical model

Hidden curriculum

**DISCUSSION**

1. Write down your definition of curriculum.
 - (a) What does your definition of curriculum include?
 - (b) Does it include a process? . . . a product? . . . materials for teaching? . . . an approach to education and methods of instruction that fosters certain values and attitudes?
 - (c) Compare your definition with the definitions given by scholars in the field. How similar or different is yours?
2. “The curriculum on paper and the curriculum in action”. What do you understand by these statement?
3. “The curriculum is too examination-oriented and children are deprived of their childhood”. Discuss.
4. “An over-loaded curriculum is a concern of many teachers. Increasingly, teachers are feeling that there is not enough time to cover all the traditional material being put into the curriculum”.
 - (a) To what extent do you agree?
 - (b) Suggest solutions to overcome the problem.



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Chapter 2 ▶ Introduction to Psychology

CHAPTER LEARNING OUTCOMES

By the end of this chapter, you be able to:

1. Define what is psychology;
2. Trace the origin of psychology;
3. Compare philosophy and psychology in explaining human learning;
4. List the branches of psychology;
5. Compare the various research methods in psychology;
6. Identify the differences between the teacher as a theorist and the teacher as a practitioner-researcher; and
7. Compare the various definitions of learning.

CONTENT

Introduction

- 2.1 What is Psychology?
- 2.2 History of Psychology
- 2.3 Branches of Psychology
- 2.4 Research Methods in Psychology
- 2.5 Psychology of Learning and Education
- 2.6 What is Learning?

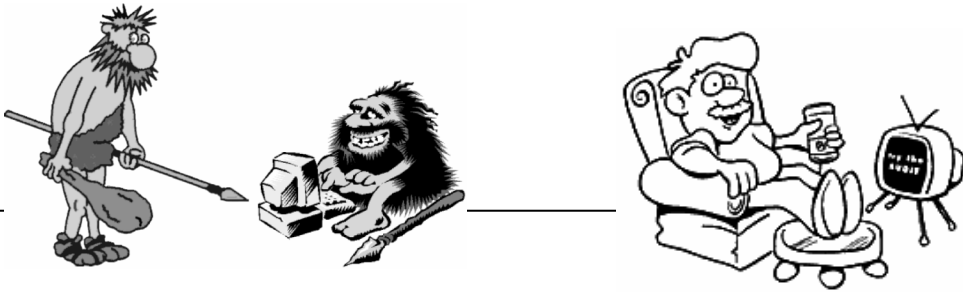
Summary

Key Terms

Readings

► INTRODUCTION

This chapter traces the origin of psychology as a discipline. You will learn how psychology, which has its roots in philosophy, plays an important role in explaining how humans learn, think and behave. Even though psychology is among the youngest disciplines in the social sciences, it has contributed much towards understanding human behaviour. However, there is much we do not know about ourselves and perhaps never will. There is so much variability in our behaviour depending on our culture, social position, political orientation, upbringing and more recently; our genetic makeup.



The human being (*Homo sapiens*) is an unattractive smelly and aggressive creature that walks upright, grumbling and bellowing. It is one of many species that lives on this planet and emerges among the worst adapted. Its young is helpless compared to other species. It has lost most of its bodily hair and what is left is little protection against the cold. Its eyesight is weaker than that of many other species, and its sense of smell responds only to the strongest odours. If pursued, it can only run a very short distance, that also very slowly. It is remarkably unskilled at climbing trees or digging holes. It cannot live under water and it swims with less grace than almost any other animal. It is heavy and awkward and cannot fly. It can't even jump very high. It is unequipped by nature with weapons either for defence or killing for food. It is absolutely remarkable and utterly fascinating that the species has survived at all.

[Source: Adapted from Guy R. Lefrancois, *Psychology for Teaching*, 1982. Belmont, CA: Wadsworth Publishing Company. p.6]

Yes, it is truly remarkable that we have survived all these years. The humorous description by Lefrancois is something to think about. How has the physically inferior human being survived? He has survived because of his God-given capacity to THINK. This capacity to think has enabled the human being to overcome his many deficiencies. For example, the human who is not naturally endowed with weapons invented spears, bows and arrows to hunt animals for

food. Human eyesight is inferior compared to other species and he invented the telescope. Humans are less strong than many other species and invented the pulley and lever to lift heavy things. The capacity to think has enhanced our ability to survive which simply means learning to cope with the world.

Bruner (1964, 1966) sees human survival as a process of amplifying capacities and reducing inadequacies. Humans began with *amplification of motor capabilities* with the invention of simple machines (wheel, pulley) followed by *amplification of sensory capacities* with the invention of telescopes, radio and television, and culminating in the *amplification of intellectual capacities* with the invention of theory. Humans used their intellectual capacities to propose concepts, principles, theories and laws to explain and understand various phenomena in their environment. Among the many phenomena humans are attempting to unravel and understand is their own behaviour (and the behaviour of other species). This gave birth to the discipline called psychology.

2.1 WHAT IS PSYCHOLOGY?

(a) Definition of Psychology

'Psychology' is an ancient Greek word made up of *psyche* which is the mind or the soul and *logy* which means study. Simply put, psychology is the study of the mind or the soul. Many psychologists prefer to focus on the mind and leave the issue of the soul to theology and the great religions of the world. Though it is largely concerned with the study of humans, the behaviour of animals is also studied. In fact, many of the earlier theories of psychology originated from studies conducted with rats, pigeons, cats, monkeys and dogs. These theories have been used to describe human behaviour and have influenced educational practice.

The Concise Oxford Dictionary defines psychology as the *scientific study* of the *human mind* and its functions, especially those *affecting behaviour* in a given context. The American Heritage Dictionary defines psychology as the *science* that deals with *mental processes* and *behaviour*. It also includes the study of the *emotional* and behavioural characteristics of an individual or group. In short, psychology may be defined as the scientific study of behaviour and mental processes. There are three key words and phrases in these definitions, namely, scientific, behaviour and mental processes.

- The first is the term *scientific* which means the study uses a scientific method. The scientific method proposed by Dewey (1920) comprises the following steps:

1. A statement of the problem and identification of the hypothesis to be tested.
 2. The design of the study and employment of data collection techniques to answer the research question or hypothesis.
 3. The collection and analysis of data.
 4. Report of the findings and decision on whether to accept or reject the hypothesis.
- The second term is *behaviour* which relates to whatever activity (by a human or animal) that can be observed, measured and recorded. Behaviour is also observed to occur when individuals speak or write something. For example, a person who records his or her fear or attitude is a manifestation of behaviour.
 - The third term is *mental processes* which include all processes involved in thinking, memory, learning, attitudes, emotions and so forth. This has become the focus of many psychologists but the problem is that these processes cannot be observed and are difficult to record and measure accurately. [*This is an issue which will be discussed later in the chapter*].

(b) **The Psychologist and the Scientist**

Both the psychologist studying human behaviour and the scientist studying the physical world use the scientific method. However, for the psychologist, humans possess neither the simplicity nor the predictability of the physical world. Even the behaviour of a cat or dog is unpredictable! The physicist, the chemist and even the biologist, employing the scientific method, has been able to discover great theories and laws explaining the behaviours of physical matter, molecules, cells and so forth. These explanations are more stable, precise and replicable. The psychologist is still struggling with having to discover a single, precise and magnificent law explaining the behaviour of a human or even a rat.

Even though the scientific method is widely used in psychology, researchers have to make various kinds of inferences and interpretations. Why? This is because the subjects studied are humans. Compared to cells or chemicals studied by scientists, humans are comparatively less stable (see Figure 2.1). Studying the behaviours of humans is more complicated because of the influence of extraneous variables that are difficult to control. Oftentimes it requires researchers to make inferences or interpretation because the data is comparatively less clear-cut.

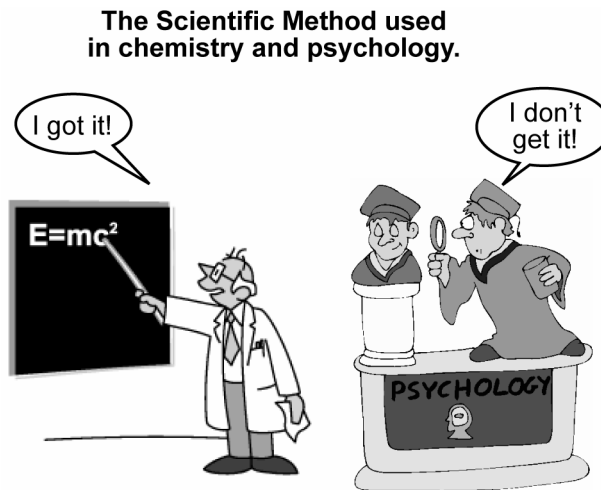


Figure 2.1: The scientific method used by the scientist and the psychologist



Self Check 2.1

- (a) Trace the origin of the word 'psychology'.
- (b) Explain the three key attributes of the definition of psychology. Discuss the main issue concerning the scientist studying physical phenomena and the psychologist studying human behaviour.

2.2 HISTORY OF PSYCHOLOGY

(a) The Roots of Psychology

Psychology is interested in the nature of human beings and how they function. However, psychology is by no means the only field of inquiry that seeks answers to the puzzles of human nature. The roots of psychology can be traced to the ancient philosopher based on their early records to understand psychology. The earliest roots of modern psychology can be traced to two different approaches to human behaviour: philosophy and physiology (see Figure 2.2). *Philosophy* explores and attempts to explain human nature through introspection or self-examination of one's experiences. Through a process of self-questioning and asking others questions, philosophers have attempted to unravel how we think, how we learn, how we gain knowledge and how we use our experiences.

On the other hand *physiology* is the study of the human body. Through observation, early Greek scholars attempted to understand the workings of the human body.

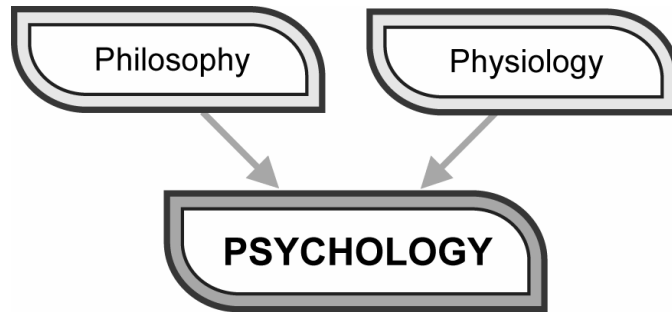


Figure 2.2: Roots of psychology

The First ‘Psychological Experiment’

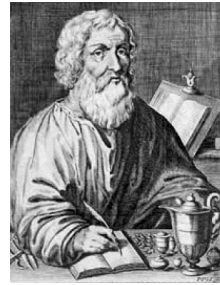
An experiment by King of Egypt, as far back as the seventh century B.C., could be considered the first psychology experiment. The king wanted to test whether Egypt was the oldest civilisation on earth. His idea was that, if children were raised in isolation from infancy and were given no instruction in language of any kind, then the language they spontaneously spoke would be of the original civilisation of man – hopefully, Egyptian.



The experiment, was flawed but the king deserved credit for his idea that thoughts and language a from the mind and his ambition to test such an idea. While the experiment failed to support the king’s hypothesis, Morton Hunt (1993) suggested that it did illustrate perhaps the first evidence in written history that as long as 2,700 years ago there was at least one individual who had the “highly original notion” that mental processes could be systematically investigated and studied.

[Source: Morton Hunt, The History of Psychology, 1993, p.1]

Early philosophers were most concerned with nature of knowledge or epistemology. In epistemology, you ask such questions as: What is knowledge? What are the origins of knowledge? What does it mean to know?



Hippocrates
460-377 B.C

- **Hippocrates** (460-377 B.C.), known as the father of modern medicine, argued that there was a close connection between the mind and the body. He proposed that mental illness was not caused by demons but by physical malfunctions. By dissecting human cadavers and operating on living organisms, he concluded that the mind controlled the human body. He was the first to suggest that the mind resided in the brain.
- **Plato** (427-347 B.C.); who lived at about the same time; also subscribed to Hippocrates' view that the mind and body were separate and that the mind was located in the brain.
 - He believed that *reality* did not lie in concrete objects but was represented in abstract form in our minds. In other words, when we see a chair, the 'real' chair exists in our minds. Plato reasoned that the head is the seat of the mind.
 - Plato was a rationalist who believed that knowledge was gained through thinking and analysing in an effort to understand the world and people's relationship to it.
 - He said the mind and body interacted with one another but were essentially different. The mind was superior to the body. Truth was found in our thoughts (via introspection) and not through our senses (via observation).
 - Plato's views formed the foundation for theorising about psychological processes, an activity that might or might not lead to subsequent empirical investigation.
- **Aristotle** (384-322 B.C.), who was Plato's student, disagreed with him on many points. He argued that the mind and body were NOT separate and felt that the mind and body were one and the same.
 - He believed that we could understand the mind by studying the body and that we relied on observation of concrete objects and actions rather than on our own thoughts (introspection) to discover truth.
 - He argued that *reality* lay only in the concrete world of objects that we apprehended through our senses.

- Aristotle was an empiricist who believed that knowledge was gained through experience, observation and experimentation. Aristotle's views formed the foundation for the methods of empirical psychological research.
- **Ibn Sina** (980-1037), a Muslim philosopher famous for his works on medicine, viewed the human being as consisting of both hidden (*sirr*) and open (*alin*) elements. The hidden part consisted of the powers of the mind while the open part was the human body and its organs (Abd al-Rahman al Naqib, 1993). The powers of the mind or mental faculties were classified into three groups:
 - First, the group of vegetative faculties, which humans and plants both share. These are concerned with the survival of the human being, growth through nutrition and preservation of the species through reproduction. The group comprises three faculties – feeding, growth and reproduction.
 - Second, the group of faculties shared by humans and animals. They comprise two faculties. One is the perceptive faculty of the exterior world through the five senses – sight, hearing, smell, taste and touch. The other faculty is directed from within, by way of common sense, imagination, memory and reflection.
 - Third, the group of faculties which distinguish human beings from animals. It comprises two faculties – an active faculty directing the human's practical conduct, and a cognitive faculty directing his or her intellectual conduct. The first is practical and the second is contemplative.



Ibn Sina
980-1037

There seems to be consensus among these early philosophers that the mind and body relationship is important in determining human behaviour. Most psychologists today agree that the concept of mind and body have merit. But, more important was to provide empirical evidence to confirm the relationship between mind and body.

(b) **The Beginnings of Modern Psychology**

- **Rene Descartes** (1596-1650), a French mathematician and philosopher, took up the viewpoint that introspection and reflection were investigatory methods superior to observation. Descartes revived the Platonic ideas of mind-body dualism and innate (versus acquired) knowledge.
 - He said that what separated humans from animals was that humans had a non-material, spiritual mind and a material body. The human mind and its powers were supreme.
 - He was known for coining the famous phrase "*Cogito ergo sum*" (I think therefore I am).
 - Though he gave supremacy to the mind, he agreed that the body could influence the mind. He viewed the mind as superior to the body and said that there was a two-way interaction between mind and body.

- **John Locke** (1632-1704), an Englishman, believed that the interaction between mind and body was an equal relationship between two aspects of the same unified phenomenon.
 - He argued that the mind depended on the body through the senses for its information while the body depended on the mind to process and store sensory experiences for later use.
 - He was also an empiricist and believed that humans were born without knowledge, which was subsequently acquired through experience and empirical observation. He proposed the term *tabula rasa* (blank slate) to describe this condition. Life and experience, according to Locke, "write" knowledge on each of us.

- **Immanuel Kant** (1724-1804), a German philosopher, began the process of trying to reconcile or synthesise the competing viewpoints of mind and body. He redefined the mind-body question by asking how the mind and body were related rather than whether the mind was in control.
 - Kant proposed that humans had a set of faculties or mental powers – senses, understanding and reasoning. These faculties, working together controlled and provided a link between mind and body, thus integrating the two.



**Immanuel
Kant
1724-1804**

- Kant believed that to understand the mental faculties we must use both rationalistic and empirical approaches.
- He believed that there were two types of knowledge – experiential which he called *a posteriori* knowledge, meaning from afterward (after the fact) and *a priori* (from beforehand) or general knowledge that existed regardless of one's experience.
- An example of the latter type of knowledge would be our knowledge of time. He argued that understanding required both types of knowledge; *a priori* knowledge permitted us to make use of *a posteriori* knowledge.
- For example, with respect to time, we link together our fleeting sensations into a seemingly continuous stream of existence in which one event precedes and causes another event (cause and effect relationships). Understanding involves both nature (innate concepts and abilities) and nurture (knowledge gained through experience).

The issues confronted by philosophers, physicians and psychologists were so intertwined that when psychology was starting out as a field of study in the late 1800s it was viewed by some as a branch of philosophy and by others as a branch of medicine. Gradually, the psychological branches of philosophy and medicine broke away from their parent disciplines and psychology increasingly became a distinct, unified scientific discipline focused on the study of mind and behaviour.

Contemporary psychology continues to wrestle with the same issues that philosophers and physiologists wrestled with. As you explore the field you will hear this continuing debate. Most philosophers agreed that human behaviour and mental processes synchronised to adapt to the environment. Charles Darwin in his theory of natural selection suggested that only those organisms that adapted well to their environment thrived. Humans, thus far, both as a species and as individuals, have adapted and thrived.

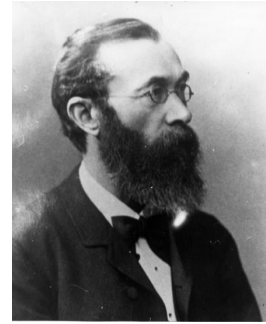


Self Check 2.2

- (a) What was the main issue philosophers were concerned about?
- (b) What were the similarities and differences in their arguments?

(c) **The Birth of Psychology**

The year 1879 is generally regarded as the year in which psychology as a formal science was officially born. A German scholar named Wilhelm Wundt (1832-1920), who was trained in both philosophy and medicine, wrote in his first book on sense perception in 1862 that psychology could become a science only if it employed the experimental method in studying the workings of the mind. In a subsequent publication in 1873, he announced that he intended to make psychology a science and he established the first psychology laboratory in Leipzig, Germany, in 1879. Others in both North America and Europe were also doing psychological research at this time but Wundt's laboratory was the first to be formally established and to have its research results published in a scholarly journal. These were among the reasons that he was credited as the primary founder of the modern discipline of psychology.



Wilhelm Wundt
1832-1920

Many of America's early psychologists received their training in Wundt's lab. The focus of research in the Leipzig laboratory was on sensation, perception, imagery and attention. Wundt doubted that more complex processes could be studied experimentally. One of Wundt's favourite research methods was "trained introspection." Wundt and his associates and students trained research subjects to carefully observe and analyse their own mental experiences – including sensations, mental images and emotional reactions – under controlled conditions. The training of subjects in introspection was rigorous and exhaustive. Wundt hoped that by providing such training he could produce reliable, verifiable and objective results. In the long run, however, it proved to be impossible to use introspection to produce reliable results and the approach was abandoned as a research technique by other psychologists.

- **Structuralism and Functionalism**

In the early days of psychology, there were two dominant theoretical perspectives. *Structuralism* was the name given to the approach pioneered by Wundt. The term originated from Edward Titchener, an American psychologist who had been trained by Wundt. Structuralism relied on trained *introspection*, a research method whereby subjects related what was going on in their minds while performing a certain task. However, it proved to be an unreliable method because there was too much individual variation in the experiences and reports of research subjects (Wade & Tavris, 2002).



'Introspection':
Looking into
ourselves and
describing how we
think

An American psychologist named William James (1842-1910) developed a competing approach, which came to be known as *functionalism*. He argued that the mind was constantly changing and it was pointless to look for the building blocks of experience. Instead, focus should be on how and why an organism did something. It was suggested that psychologists should look for the underlying cause of behaviour and the mental processes involved. This emphasis on the causes and consequences of behaviour influenced contemporary psychology.

- **Psychoanalysis**

Another early theory in psychology was developed by the Austrian physician, Sigmund Freud (1856-1939). Originally trained as a neurologist, Freud became interested in how psychological factors might contribute to some of his patients' problems. He became convinced that many of his patients' symptoms had mental rather than physical explanations. In particular, he believed that early experiences such as conflicts and traumas had caused such distress for his patients as children that the memory of them was extremely threatening and therefore the patients were unable to consciously recall these events.

He believed that even more important than our conscious thoughts in determining how we react and respond to events were forces that operated unconsciously. Such unconscious material as repressed wishes, conflicts, guilty secrets, yearnings and desires exerted a powerful influence on our behaviour and emotional reactions.

Freud gradually developed his ideas into a broad theory of human psychological functioning and a method for treating patients with psychologically based disorders. Both the theory and the treatment method became known as *psychoanalysis*.

- **Behaviourism**

A very different approach to psychology emerged in the early 1900s. The work of several scholars contributed to the development and growth of this approach but one of them, the American John B. Watson (1878-1958) was typically credited as the "*father of behaviourism*". Behaviourism is a theoretical perspective that is based on the premise that scientific psychology should study only observable behaviour. In 1913, he published an article that has since become known as "The Behaviourist Manifesto". In it, he argued that psychology should altogether abandon the study of consciousness (mental

processes) and attend only to directly observable, and therefore, verifiable, behaviour [*We will discuss this further in Chapter 2: Behavioural Learning Theories*].

A strict empiricist, Watson proposed a revolutionary re-definition of psychology. He argued that mental processes were not a proper subject of study for a scientific discipline because there were private events which could not be examined by an impartial observer. He proposed that psychology should instead be the science of behaviour. Watson's ideas and the works of Thorndike and B.F. Skinner became the dominant theoretical perspectives in much of psychology from the 1920s to the 1960s.

- **Cognitivism**

The 1960s saw the rejection of behaviourism and the emergence of the *cognitive revolution*. The movement was composed of psychologists who challenged the prevailing behaviourist model of human functioning and insisted that focus should shift towards studying “interior” mental processes. Using the computer as an analogy, researchers provided important clues and directions in understanding the human brain – how it perceives, stores and organises information and how information is used to make decisions and solve problems.

Among the prominent scholars who developed various theories explaining human cognition were Miller (1956), Atkinson and Shiffrin (1968), Bartlett (1932), Festinger (1957) and many others [*We will discuss further in Chapter 3: Cognitive Learning Theories and Chapter 4: Information Processing Model*]. A broad array of disciplines such as cognitive psychology, linguistics, artificial intelligence, semiotics, neuroscience, anthropology and philosophy have contributed to the emergence of what we now call “cognitive science”.



Self Check 2.3

- What is the main difference between structuralism and functionalism?
- State one difference between psychoanalysis, behaviourism and cognitivism.

2.3 BRANCHES OF PSYCHOLOGY BASE

As mentioned earlier, psychology is the scientific study of behaviour and mental processes. Psychology as a discipline aims to describe, explain and predict behaviour as well as control or modify some behaviour. Psychology does not have a single unifying theoretical perspective. Rather, it is a discipline comprising various theoretical viewpoints. Sometimes it seems that these perspectives are competing with each other, but many psychologists tend to agree that the various perspectives complement each other.

BRANCHES	RESEARCH FOCUS
Developmental Psychology	The study of changes that accompany age throughout the lifespan of human. These persons are called developmental psychologists, child psychologists, gerontologists and lifespan psychologists.
Physiological Psychology	The study of the biological basis of behaviour focusing on neuropsychology, psychobiology, genetics and heredity.
Experimental Psychology	The study of basic psychological processes involving learning, memory, perception and emotion.
Personality Psychology	The study of differences among individuals, development of personality types and measurement of personality traits.
Social Psychology	The study of how people influence one another and group behaviour focusing on communication, political behaviour and the formation of attitudes.
Industrial & Organisational Psychology	The study of selection and training of personnel, improvement of productivity, working conditions, stress and other worker problems.
Clinical & Counselling Psychology (Applied Psychology)	<i>Clinical psychology</i> : Diagnosis, cause and treatment of psychological disorders as well as development of programmes for the prevention of emotional illness. <i>Counselling psychology</i> : 'Normal' problems of adjustments in life and coping with the problems of daily life.
Evolutionary Psychology	The study of the evolutionary origin of behaviours and characteristics, their adaptive value and how they change over time to meet the demands of the environment.

Cognitive Psychology	The study of human intelligence and how people think.
Educational Psychology	The study of efforts to improve teaching methods and materials, solve learning problems and measurement of learning ability and educational progress.
Abnormal Psychology	The study of behaviour disorders and disturbed individuals such as the causes of violent or self-destructive behaviour or the effectiveness of procedures in treating emotional disturbances.

Figure 2.3: The different branches of psychology and research focus

A more complete and accurate picture of human behaviour and mental processes is better understood by integrating these various perspectives. That being said, it remains true that individual psychologists tend to specialise in and emphasise a particular theoretical perspective. Because it considers the mental, attitudinal, motivational and behavioral characteristics of individuals, psychology has many subdivisions and areas of specialisation and is a more complex field than many realise. Among the major branches within psychology is shown in Table 1.1. At times psychologists blend particular combinations of these theoretical perspectives together. For example, some psychologists are interested in studying how abnormal behaviour is related to various brain structures. These psychologists might combine perspectives from physiological psychology and abnormal psychology. Other psychologists might combine cognitive psychology and social psychology to study thinking and racial attitudes and call the perspective social cognition. Still other psychologists might describe themselves as eclectic in their orientation which means that they draw upon several theoretical perspectives in their work.

You will notice that ‘learning’ is seldom considered a separate branch of psychology but is studied specifically within cognitive psychology, educational psychology, experimental psychology, developmental psychology and counselling psychology. Learning is also studied indirectly within personality psychology, abnormal psychology and social psychology. Besides the branches of psychology listed, there are also newer branches of psychology, each giving a somewhat different emphasis. Some of these newer branches are environmental psychology, health psychology, forensic psychology, race psychology and neuropsychology. As society becomes more modern and complex, one can expect the emergence of newer branches of psychology attempting to understand and explain human behaviour in these environments.

2.4 RESEARCH METHODS IN PSYCHOLOGY

Example #1: Do university students remember information longer after preparing for essay exams than for multiple-choice exams?

Answer: The question is testable but needs to be more precise. What types of memory? What age group? Are memory tests biased towards one age group over another?

Example #2: Are some people born evil?

Answer: This question is not testable because there is no way to measure evilness in newborns and later as adults. Perhaps, in the future, neuroscientists may identify biological markers (such as chemicals or structures in the brain) for evilness that could be measured in newborns.

The key in doing research in psychology is science. Science is a way of asking and answering questions through careful observation and rigorous analysis. Psychological science attempts to describe and explain human nature. To achieve its goals, psychology uses a number of methods such as experiments, observation, surveys, correlational methods and case histories.

(a) EXPERIMENTS

The experimental method is used by psychologists inside the laboratory as well as outside. Experiments take place in laboratories because the researcher is able to carefully control conditions and take measurements accurately using various kinds of instruments such as computers. However, it is not essential for all psychological problems to be brought into the laboratory for study. To show the effects of certain treatments and procedures in real-world settings, experiments are conducted outside the laboratory.

An experiment is a research method used to determine the effectiveness of a particular action or treatment on a single or group of organisms. To show that a particular treatment has an effect or brings about a particular change, the researcher has to control all other factors that might influence the occurrence of the particular change. The experimental method is the best method to show effectiveness of a particular treatment (eg. teaching method, curriculum innovation). Experiments are ideally suited for the task of causal analysis (claim to show "*cause and effect*"). No other method of scientific inquiry permits the researcher to say with confidence that "X (praising young learners) caused Y (to repeat the task) to happen". Hence, it is important that you use the

word "effectiveness" carefully, as it only applies if you are using the experimental method.

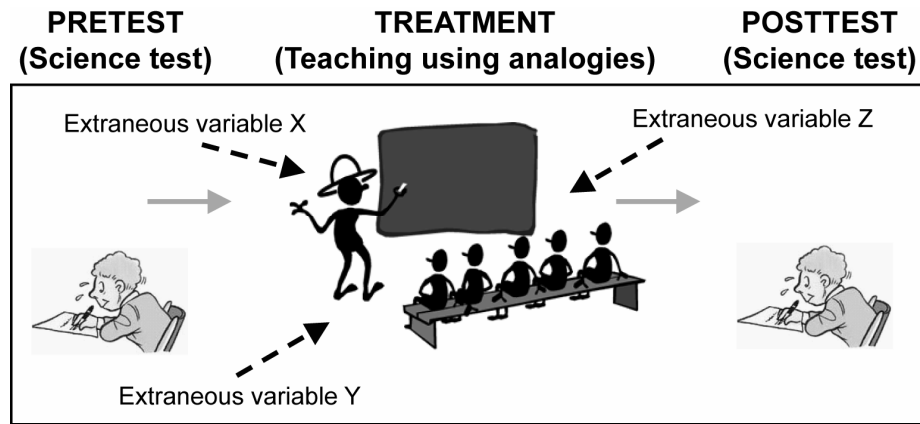


Figure 2.4: A simple experiment in psychology

See Figure 1.4 which shows a simple experiment to determine whether teaching young learners using analogies (e.g. blood circulation is like a river and its tributaries) "causes" them to perform better academically in science ("effect"). The experiment involves administering a treatment (independent variable) such as teaching science using analogies. A pretest (dependent variable) is given before the experiment and the same test or equivalent test is given after the experiment. The differences between pretest scores and posttest scores will determine whether teaching using analogies improves performance in science.

A key problem in conducting experiments is establishing suitable control, so that any change in behaviour can be attributed only to the treatment introduced by the researcher. Control means ruling out other possible causes for the changes in the behaviour of subjects (see Figure 1.4). There are many extraneous variables (irrelevant or unrelated or unconnected factors) that need to be controlled so that they do not contaminate or interfere with the findings of the study. Once an extraneous variable creeps into an experiment, the researcher can no longer draw any conclusion regarding the causal relationship that exists between the independent and the dependent variable (Christensen, 1988).

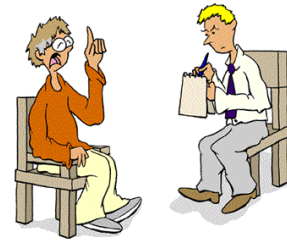
In experiments conducted outside the laboratory in natural settings many factors not related to the treatment may influence performance in the posttest. With reference to Figure 1.4, some students may have discussed with their friends at home concerning the science topic, while others may have viewed a programme on the topic on TV. So, improved performance

on the posttest may not be attributed to the treatment but due to the influence of other factors. Therefore, it is necessary to control for the influence of these outside factors or variables in order to attain internal validity.

Some experiments have both an experimental group and a control group. An *experimental group* consists of subjects who are exposed to the treatment. For example, a particular counselling technique is used for a group of juvenile delinquents. The *control group* consists of subjects who do not receive the treatment (i.e. they are not 'treated' with the counselling technique). Comparison between the experimental group and the control group determines the effectiveness of the counselling technique. In some experiments there may be more than one experimental group; subjects treated with two or three different methods or techniques or procedures are compared with the control group who do not receive any of the treatments. You can also compare the effectiveness of different treatments on the dependent variable.

(b) OBSERVATIONAL METHODS

The observational method of research concerns the planned watching, recording and analysis of observed behaviour as it occurs in a natural setting. To achieve this aim, precautions must be taken to avoid interfering with the behaviour. Such precautions usually include concealment of the observation team and their equipment. For example, in studying how young children interact socially in a preschool situation, investigators may videotape their behaviour through a one-way mirror so that the children are unaware that they are being observed. You can well imagine that the children's behaviour might change if the investigators were to intrude openly into the situation.



**As I was saying.....we should make a serious effort to improve.....
But, on the other hand, it is also.....**

(c) SURVEY

Some problems are difficult to study by direct observation may be studied through the use of survey questionnaires or interviews. What is a survey? Survey research involves selecting a small or large population and studying samples chosen from that population to discover the relative incidence, distribution and interrelations of sociological and psychological variables. It is a method of obtaining information about a population from a sample of individuals. Surveys can provide a quick, inexpensive and accurate means of obtaining information from a large group of people. If you want to know

about the opinions, attitudes and perceptions of respondents, survey is an appropriate method of collecting data. Besides, surveys can also be used to explain the relationship and differences between variables. The term *sample survey* is often used because a sample which is representative of the target population is used. The survey method is widely used in psychology. Basically, information is obtained by asking people questions either orally or in written form e.g. on paper or computer screen concerning:

- What they know (e.g. who was the first Prime Minister of Malaysia?)
- What they believe? (e.g. should students be given the freedom to express themselves?)
- What they expect? (e.g. do you think you expect to be a famous person?)
- What they feel? (e.g. do you think your father was fair?)
- What they have done? (e.g. how often do you use the computer in a week?)
- What they plan? (e.g. do you intend to continue studying or work?)

An adequate survey requires a carefully pre-tested questionnaire, interviewers trained in its use, a sample of people carefully selected to ensure they are representative of the population to be studied and appropriate methods of data analysis, so that the results can be properly interpreted.

(d) **CORRELATIONAL METHOD**

The correlational method is a technique whereby two or more variables are systematically measured and the relationship between them (i.e. how much one can be predicted from the other) is assessed. A positive correlation means when one variable (e.g. stress) increases, the other variable (e.g. illness) increases. However, because two variables correlate, it does not mean that one thing cause, the other. For example, stress and illness correlate, but that does not mean stress causes illness. A negative correlation means when one variable increases, the other associate variable decreases. For example, the correlation between the number of cigarettes a person smokes and the number of years a person can expect to live.

(e) CASE HISTORIES

Scientific biographies, known as case histories, are important sources of data for psychologists studying individuals. There can, of course, be case histories of institutions or groups of people as well. Most case histories are prepared by *reconstructing the biography* of a person on the basis of remembered events and records. Reconstruction is necessary because the individual's earlier history often does not become a matter of interest until the person develops some sort of problem; at such time, knowledge of the past is important for comprehension of present behaviour. The retrospective method may result in distortions of events or oversights, but is often the only method available.

Case histories may also be based on a longitudinal study. This type of study follows an individual or group of individuals over an extended period of time, with observations made at periodic intervals. The advantage of a longitudinal study is that it does not depend on the memories of those interviewed at a later date.

**Self Check 2.4**

- (a) List the main difference between different branches of contemporary psychology.
- (b) Describe the research methods used in the study of psychology.

2.5 PSYCHOLOGY OF LEARNING AND EDUCATION

The Teaching Profession and Psychology

What is the difference between a *bomoh* (medicine man) and a medical practitioner? For example, when approached by a person with high fever; both will note the symptoms and prescribe relevant remedies. The *bomoh* might suggest that the patient chew the bark of the chinchona tree which contains quinine while the medical practitioner might prescribe a capsule containing quinine. The method of prescription is not the issue. The essential difference is the reasons for the given treatment. The medical practitioner will rely on his network of knowledge and procedures based on science. The *bomoh* might give a logical explanation stating that it worked in the past and based on the inductive

principle that 'if such-and-such works for this ailment, it is likely to work again. The cure rate by *bomohs* might not differ from that of your friendly neighbourhood general practitioner. Yet, society regards the medical practitioner as a professional and the bomoh as not. What, then, is the difference between a profession and a craft or trade? According to Telfer and Rees (1975), a profession requires a licence to practise. It requires intensive education in the theoretical knowledge that gives validity to the skills and expertise required to practise.

Is teaching a profession? In Malaysia, to be able to teach in government primary and secondary schools, all teachers need to provide evidence of credentials in education such as a diploma in education, a certificate in education or a bachelor's degree in education. In obtaining these credentials, they will learn about psychology as the scientific study of learning as well as various teaching methods.

Does that make teaching a science? As mentioned by William James in 1899, "Psychology is a science, and teaching is an art". The question that arises is whether 'teaching as an art' can use psychology as its underlying theory. Although teaching may well be an art, there is theory behind the practice of that art, and that theory is drawn from psychology. Teachers, of course, have to know their subject matter and together with theoretical knowledge about the nature of learning can claim their art to be a profession. An educator who does not have an in-depth understanding of psychology will not appear convincing in explaining the underlying principles for his or her action in the classroom. At the end of the day, most of what we do in education is to ensure that THE LEARNER HAS LEARNED. Learning is the core business of education, and obviously the educator has to know about how humans learn. Regardless of whether you are an administrator, curriculum developer, counsellor or discipline teacher, your main task is to ensure that all your actions lead to the enhancement student learning.

Teacher as a Theorist

You may be a teacher in a primary or secondary school. You may be an instructor or lecturer in a tertiary organisation. You may be a trainer in a business or industrial organisation. Essentially, you are an educator and a professional. A professional does his or her work based on a set of principles, theories and laws. Hence, educators need to enhancement with theories related to the psychology of learning (see Figure 2.5).

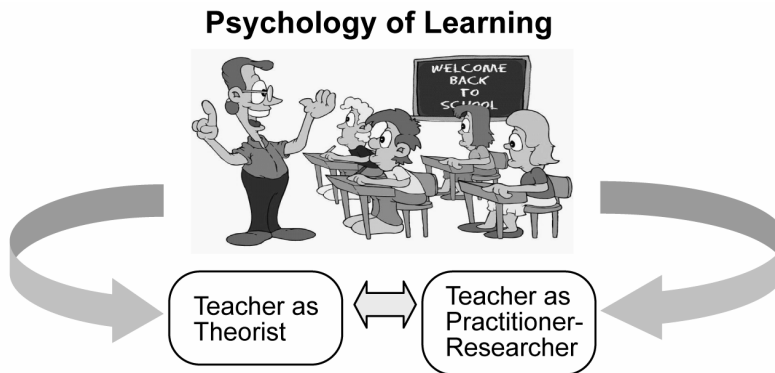


Figure 2.5: Teacher as theorist and practitioner-researcher

In this course, you will be introduced to a pool of concepts, principles and theories about human learning. As you read this material, think of yourself as a theorist. Some teachers, lecturers, instructors or trainers may be of the opinion that theories are a waste of time as they are 'still theories'. It should be reiterated that most that is done in the classroom or lecture hall is based on some theory or principle of human learning. For example, the idea of giving immediate feedback is based on the theory that informing students how they are performing motivates them to learn.

It is likely that you have a set of assumptions, beliefs or theories on what constitutes effective teaching and what steps you have to take to be an effective teacher. These beliefs and theories serve as your current theoretical base for your actions in the classroom. It would be beneficial if you were to compare your beliefs with the concepts and theories on learning discussed in this course. Test the accuracy of your assumptions about student learning as you examine the theories proposed by scholars in the field in the last 100 years.

Perhaps, you may realise that some of your beliefs about student learning are confirmed while others may be myths. For example, you may assume that low achievers are not 'intelligent' when in fact they lack skills in learning from text material. Some of our common sense beliefs about student learning may not be accurate in light of what we know about theory and research governing human learning. For example, we may think that it is all right to 'stream' students according to ability, when in fact it can prove destructive when low achievers are grouped together for the rest of their schooling years.

As you proceed through this course, many of your personal beliefs and theories about the teaching-learning process may find support, while others may be proven less accurate. This awareness will help you develop a more accurate

guide for your professional development (Tan, Parson, Hinson & Sardo-Brown, 2001).

Teacher as a Practitioner-Researcher

You would be concerned being treated by a doctor who is not aware of the latest research in medicine. Imagine the consequences of a doctor prescribing a pharmaceutical product that has since been banned in the United States! Similarly, as a teacher, your students and society expect you to be well-informed about developments in human learning and their application in the classroom. The material in this course provides a source of practical ideas that may be used to enhance teaching or training. The scientific information you acquire about human learning can be applied in specific ways to improve teaching. You may have been a teacher for many years and it is likely that you may approach your profession differently after having been exposed to the concepts, principles and theories of human learning. Some of this scientific information you may already be familiar with, while others may be new to you. With this store of information, you may be encouraged to analyse your present practice, particularly its strengths and weaknesses.

The principles, suggestions and examples are intended to help you think about how you can apply psychology to teaching. The rich source of ideas may encourage you to re-examine your teaching and find ways and means of improving what you do in the classroom. Hopefully, the information provided will encourage you to see the classroom and education in general differently. It is possible that you may have been preoccupied with some aspects of teaching and have ignored other facets of instruction.

Effective teachers are reflective teachers. Reflective teachers know what they are doing, why they choose to do it and review the effectiveness of what they have done. It is possible that some teachers may be motivated to try out some of the strategies in the classroom. To systematically tryout strategies in the classroom, the method of *action research* is suggested. Action research is a systematic method of data collection by the teacher. For example, you employ the techniques of action research to try out the effectiveness of a particular method of teaching mathematics.



Self Check 2.5

What is the difference between the teacher as a theorist and the teacher as a practitioner-researcher?

2.6 WHAT IS LEARNING?

If you were to ask someone, “What is learning?”, you will get different replies. Saljo (1979) asked a number of students what they understood by ‘learning’. Their responses were classified into the following five categories:

1. Learning is a quantitative increase in knowledge ‘knowing a lot’.
2. Learning is memorising; storing information that can be reproduced.
3. Learning is acquiring facts, skills and methods that are retained and used when necessary.
4. Learning is making sense or extracting meaning; it involves relating parts of a subject matter to each other and to the real world.
5. Learning is interpreting, understanding and re-interpreting knowledge.

You will notice that statements 1, 2 and 3 imply that learning is the acquisition of a body of knowledge or content. It is like going to the supermarket, when you go out to buy knowledge and it becomes your property. This has been referred to as the *product of learning*. Statements 4 and 5 define learning as something the learner does with the information. This has been referred to as the *process of learning*.

(a) Learning as a Product

Learning is seen as an outcome or the end product of some process which can be recognised. Learning is defined as a change in behaviour. Prior to learning; an organism is not able to perform a particular task but after learning, the organism is able to perform the task. In other words, learning has taken place and there is a change in behaviour. For example, before the lesson, students did not know about the formation of a *tsunami* but after the lesson, they know how it is formed. The overt change in behaviour is observed when students express their understanding of the formation of a tsunami either orally or in an essay.

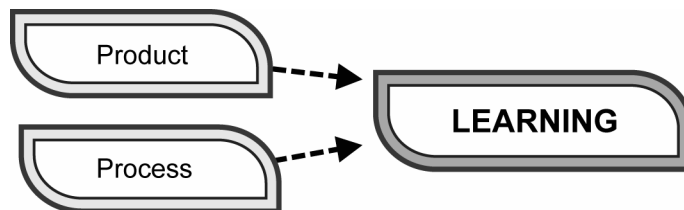


Figure 2.6: Learning as a Product and Process

(b) **Learning as a Process**

When learning is seen as a process, the focus is on what happens when learning takes place. Are people conscious of what is going on when they are learning something? Are they aware that they are engaged in learning? Can they identify the processes involved when learning something? For example, to understand the facts related to the policies of Tunku Abdul Rahman and Tun Abdul Razak Hussein, learners could use the process skill of *comparison* to deepen their understanding of the subject matter. Most disciplines or subject areas have their own process skills and when appropriately applied by learners, enhances their acquisition of the facts, concepts and principles of the respective content.

(c) **Definitions of Learning by Scholars**

The following are some definitions of learning by scholars in the field:

- **Jerome Bruner:** Learning is an active process in which learners construct new ideas or concepts based on current and past knowledge.
- **B.F. Skinner:** Learning is a function of change in overt behaviour. The probability of learning occurring is enhanced when there is reinforcement.
- **Albert Bandura:** Learning occurs when individuals observe and imitate other's behaviour.
- **Lev Vygotsky:** Learning is determined by interaction with the surrounding culture and people such as parents, peers and significant others.
- **Howard Gardner:** People learn and understand the world through at least seven ways – verbal-linguistic, visual-spatial, logical-mathematical, body-kinesthetic, musical-rhythmic, interpersonal and intrapersonal.
- **Jean Piaget:** Learning occurs through the process of assimilation and accommodation with one's schemas and constantly seeking equilibrium between these processes.
- **David Ausubel:** Learning occurs when new material is related or subsumed with one's existing cognitive structure.
- **F. Craik and R. Lockhart:** Information is processed at multiple levels. The 'deeper' the processing, the more that information will be remembered because of its many associations with existing knowledge.

- **W. Kohler:** Problem solving is facilitated when an individual receives insight into the overall structure of the problem.



Activity 2.1

- (a) What is the difference between the product and process of learning?
- (b) To what extent do the definitions of learning reflect what you do as a teacher, instructor or trainer?

SUMMARY

- This capacity to think has enabled the human being to overcome its many deficiencies.
- Psychology is an ancient Greek word made up of *psyche*, which is the mind or the soul, and *logy* which means study. It is the study of the mind or the soul.
- Studying the behaviours of humans is complicated because of the influence of extraneous variables that are difficult to control.
- The roots of psychology can be traced to the ancient philosophers based on their early records to understand psychology.
- Philosophy explores and attempts to explain human nature through introspection or self-examination of one's experiences.
- Most philosophers agree that human behaviour and mental processes synchronise to adapt to the environment.
- The year 1879 is generally regarded as the year in which psychology as a formal science was officially born when German scholar Wilhelm Wundt proposed that psychology could become a science only if it employed the experimental method in studying the workings of the mind.
- Structuralism relied on trained introspection, a research method whereby subjects related what was going on in their minds while performing a certain task.

- The mind is constantly changing and it is pointless to look for the building blocks of experience. Functionalism suggests that focus should be on how and why an organism does something.
- Psychology as a discipline aims to, explain and predict behaviour and control as well as modify some behaviour.
- Psychology does not have a single unifying theoretical perspective. Rather, it is a discipline comprising various theoretical viewpoints.
- Psychological science attempts to describe and explain human nature using a number of research methods such as experiments, observation, surveys, correlational methods and cases histories.
- The teacher, instructor, lecturer or trainer is both a theorist and a practitioner-researcher.
- Learning is both a product and a process.

KEY TERMS

Psychology	Behaviourism	Teacher as theorist
Philosophy	Cognitive revolution	Practitioner-researcher
Mind and Body	Psychoanalysis	Learning
Structuralism	Correlational method	Survey
Functionalism	Experimental method	Observation method



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Chapter 3 ▶ Introduction to Educational Assessment

CHAPTER LEARNING OUTCOMES

By the end of this chapter, you be able to:

1. Describe the imperial examination in China;
2. Identify important events in the development of educational testing in the United States;
3. Differentiate between measurement, evaluation and assessment;
4. Explain the purposes of assessment;
5. List the differences between formative and summative assessment; and
6. Justify when norm-referenced and criterion-referenced is adopted

CONTENT

Introduction

3.1 History of Educational Assessment

3.2 National Assessment in Malaysia

3.3 Tests Measurement, Evaluation and Assessment

3.4 Why Do We Assess?

3.5 Types of Assessment

3.6 Trends in Assessment

Summary

Key Terms

References

► INTRODUCTION

This chapter discusses the differences between testing, measurement, evaluation and assessment as well as the purposes of assessment. Also explored is the difference between formative and summative assessment as well as the difference between criterion and norm-referenced tests. Finally, recent trends in assessment are discussed.

3.1 HISTORY OF EDUCATIONAL ASSESSMENT

(a) IMPERIAL EXAMINATION IN CHINA

Before examining assessment in detail, let us go back in history to see how the measurement of human abilities all began. Early evidence of educational testing was conducted in China, called the Imperial Examination system or *keju* system. It originated during the Han Dynasty around 115 AD and was introduced during the Sui Dynasty around 600 AD. The examination was fully implemented across the nation during the Song Dynasty (960 – 1279) and continued to be adopted throughout the reign of the Ming and Qing dynasties. However, during the last few years of the Qing Dynasty, the examination was abolished in 1905. The examination system was conducted over 1300 years.



Figure 3.1: Examination hall with 7500 cells in Guangdong in 1873. Cheating became a big problem despite tough measures to prevent it

Before the system was introduced, most appointments in the imperial bureaucracy were based on recommendations from prominent aristocrats and existing officials, and it was commonly accepted that recommended individuals must be of aristocratic rank. What is the Imperial Examination System? It was an examination system that tested proficiency in the “Six Arts” namely; music, archery & horsemanship, arithmetic, writing and knowledge of the rituals and ceremonies in both public and private life. Later it was

expanded to cover the "Five Studies", namely; military strategy, civil law, revenue & taxation, agriculture and geography, and the Confucian classics. These examinations are regarded by many historians as the first standardised tests based on merit.

The imperial examinations were virtually the only path for common people to enjoy a privileged life if they passed (obviously competition was extremely fierce). Passing the exams became the ultimate goal of schooling. Most candidates tended to study only for the exams' sake, rather than thoroughly understanding all the material. Students tended to memorise just enough to pass the exams and many could not put their knowledge to practical use. It has been acknowledged by Western scholars today that China's imperial examination system exerted direct influence on the modern civil service examination system in the West.



Self Check 3.1

- (a) What is the Imperial Examination conducted in China?
- (b) How is the examination system similar or different from current practices in Malaysia?

(b) DEVELOPMENT OF MODERN EDUCATIONAL ASSESSMENT

Francis Galton



Francis Galton
1822-1911

The study of human abilities began with the work of Sir Francis Galton (1822-1911) who was the first to apply statistical methods to the measurement of human differences and heredity. He introduced the use of questionnaires and surveys for collecting data on human abilities and competencies. Galton was fascinated with the work of Charles Darwin (his half-cousin) and his book, *The Origin of Species*. In his own book *Hereditary Genius* (1869) he argued that human mental abilities and personality traits are essentially inherited. He coined the term "eugenics" and in which he called for methods of improving the biological make-up of the human species through selective parenthood. He went to the extent to suggest that it was possible to produce a race of highly gifted people by the process of selective breeding; He also advocated restricting people who were weak and 'feeble-minded' (Irvine, 1986) from reproducing.

Galton's study of human abilities led to the foundation of *differential psychology and psychometrics*. *Differential psychology* is the branch of psychology that concerns itself with psychological differences between people such as academic performance, attitudes, personalities and so forth). *Psychometrics* is the science of measuring mental abilities.

Alfred Binet

In 1904, the French Ministry of Public Instruction commissioned psychologist, **Alfred Binet** to find a method to differentiate between children who were intellectually normal and those who were not. The purpose was to put the 'less normal' children into special schools where they would receive more individual attention. Also, it would lessen the disruption they caused in the education of intellectually normal children. In 1905 he produced the *Binet-Simon* scale (with Theodore Simon). The test required subjects to perform 30 short tasks requiring subjects to; *name parts of the body, compare lengths and weights, count coins, assess which of several faces is 'prettier', name objects in a picture, digit span (the number of digits a person can recall after being shown a long list), word definition and filling in the missing words in sentences.*



Figure 3.2: A child performing the bead-stringing task which is part of the Binet-Simon tests of 1905

The underlying assumption was that all these tasks involved basic processes of reasoning. The tests were arranged in increasing difficulty. Each level of tests matched a specific developmental level - i.e. all tests at a given level were capable of being solved by any normal child in that specific age-group. This was a turning point in psychology: A new type of test had been produced in which the average level of performance was the criterion. In 1908 the test was revised and then again in 1911. The test results proved to be correlated with other criteria (e.g. results of school examinations, assessments of teachers, etc.). Binet is celebrated in history as the man who created the first 'intelligence test' in the form as we know them today. He is commonly known as the "father" of IQ testing.

Lewis Terman

Lewis Terman (1877-1956) of Stanford University decided to use Binet's test in the United States. He found that the Paris-developed age norms did not work very well for Californian school children. So he revised the test: adapted some items, added other items, established new age norms, and extended the upper age limit to "superior adults". This became the Stanford-Binet revision in 1916. In this revision the Intelligence quotient first appeared. The *Intelligence Quotient* or IQ was a score meant to quantify intellectual functioning to allow comparison among individuals. To arrive at an IQ score, Terman relied on a formula expressing the relation between an individual's mental age and chronological age developed in 1912 in Germany by Wilhelm Stern in 1912. This formula works fairly well for children but not for adults (Thomson, 1968)

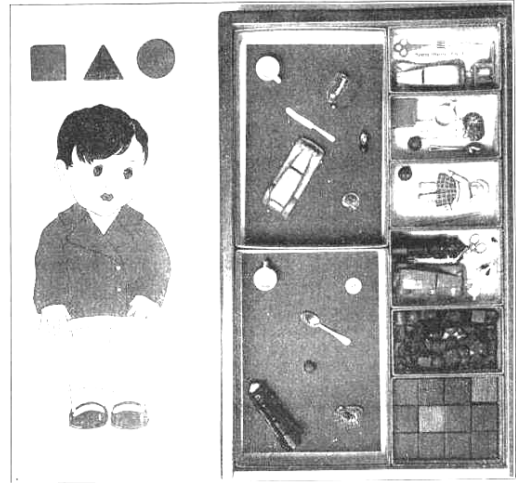


Figure 3.3: Stanford-Binet materials (1937) which shows the test materials for younger children

World War I



The US army at the beginning of WWI was faced with the problem of assessing the intelligence of great numbers of recruits in order to screen, classify, and assign them to suitable tasks. The Stanford-Binet test required a highly trained person for individual administration and proved time consuming and costly for large-scale use. So, when the US entered WWI in 1917 a committee was appointed by the American Psychological Association (APA) to consider

ways that psychology might assist the conduct of the war. The head of APA **Robert Yerkes** headed a committee to develop a group intelligence test. He assembled a staff of psychologists; and Lewis Terman was one of them. The *Army Alpha* and *Army Beta* tests were developed. The Beta was a version of the

Alpha specifically for use with non-English-speaking and illiterate persons. Instructions to those taking the Beta were given by demonstration or pantomime, rather than orally or in writing. By the beginning of 1919, nearly two million Americans had taken the tests. The Army scores were not expressed using the intelligence quotient, but instead by simply awarding points for correct answers. On the basis of these points, men were divided into one of 5 classes ranked from A to E.

After the war, industry, business and education saw potential value of psychological testing. In 1926, the Army Alpha test was modified to become the first well-known Scholastic Aptitude Test (SAT) used in the selection of students for college or university entry.



Activity 3.1

- (a) Comment on Galton's argument that human mental abilities are inherited, i.e. the nature–nurture controversy.
- (b) Do you think IQ tests should be used in Malaysian schools? Why?

Charles Spearman

Up to now, the approaches to intelligence had been very pragmatic - i.e. tests were developed for particular needs. However, another approach to understanding intelligence, involved analysing data that was already collected. In 1927, Spearman analysed the scores on various intelligence tests and using 'factor analysis' argued that, people who do well on some intelligence tests also do well on a variety of intellectual tasks such as vocabulary, mathematical and spatial abilities. And if people did poorly on an intelligence test, then they also tended to do poorly on other intellectual tests. He observed correlations among performance on a variety of intellectual tasks and proposed, a 'two-factor' theory of intelligence which consisted of:

- **“g” factor:** which is a kind of 'mental energy' or general intellectual capacity that is required for performance on all kinds of mental tests.
- **“s” factor:** which is an ability required for performance on just one kind of mental test.

This implies that if a person performs well on a test that is highly saturated with “g” that it is likely that the person will also perform well on another test that is highly saturated with “g”. Thus, the most important information to have about a person's intellectual ability is an estimate of his or her “g”. For example, scores on

a verbal comprehension test are largely determined by one's level of general intelligence but they are also affected by one's specific ability to perform verbal comprehension tasks.

The main thrust of Spearman's analysis was this idea of a general intellectual capacity. This formed a major theoretical platform for many subsequent approaches to intelligence. It might be also noted, however, that Spearman was perhaps excessively enthusiastic about *g*. For example, he advocated restricting voting rights to people whose *g* exceeded a certain level, and he was a eugenicist (eugenics comes from the Greek "eugenes" meaning well-born) - arguing that only people with a certain level of *g* should be allowed to have offspring. "*g*" was controversial then as now.

David Wechsler

David Wechsler (1896-1981) observed the scores obtained by children and came to the conclusion that intelligence was not entirely fixed. He noted that as children grew older, the variance in their scores diminished. He suspected this might be due to environmental factors. Wechsler administered the Stanford-Binet tests to army recruits and recognised that the test questions were not appropriately assessing soldiers' abilities. He felt that that the Stanford-Binet scales were too verbally loaded and so he designed an instrument with sub-tests to measure both verbal and nonverbal abilities largely borrowing from many other tests, such as the US Army Alpha test. In

He produced the *Wechsler Adult Intelligence Scale* (WAIS). The scale consisted of 11 subtests, each of which provided a score. Six of the subtest covered verbal material (such as information, comprehension, arithmetic, digit span, similarities, and vocabulary skills) and five of subtests covered performance material (such as picture arrangement, picture completion, block design, object assembly and digit symbol substitution). He also produced the *Wechsler Intelligence Scale for Children* (WISC) in 1949, which competed with the Stanford-Binet test. Later in 1963, he produced a scale which could be used with pre-primary children.



Wechsler believed that general intelligence cannot be equated with intellectual ability, but must be regarded as a manifestation of the personality as a whole. Factors other than intellectual enter into our concept of general intelligence, and

in everyday practice, we make use of them knowingly or not. Wechsler noted that some of these factors are drive, persistence, will, and preservation, or in some instances, to aspects of temperament that pertain to interests and achievement.

Leon Thurstone

Leon Thurstone (1887-1955) accepted Spearman's notion of the "g" factor but he found no conclusive evidence for "g". He identified 7 'primary mental abilities' which he judged to be more important in explaining human competence. These were:

1. **Verbal Comprehension:** vocabulary, reading, comprehension, verbal analogies.
2. **Word fluency:** the ability to quickly generate and manipulate a large number of words with specific characteristics, as in anagrams or rhyming tests
3. **Number:** the ability to quickly and accurately carry out mathematical operations
4. **Space:** spatial visualizations as well as ability to mentally transform spatial figures
5. **Associative Memory:** rote memory
6. **Perceptual Speed:** quickness in perceiving visual details, anomalies, similarities,
7. **Reasoning:** skill in a variety of inductive, deductive, and arithmetic reasoning tasks

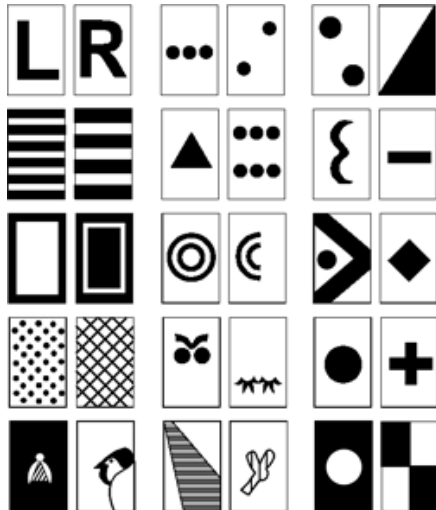
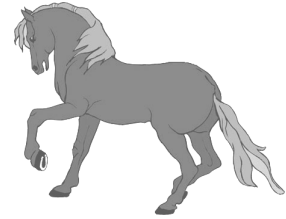
Thurstone's approach is significant because it is the first multi-factor approach to intelligence. He argued that intelligence is better described and measured by considering distinct primary mental abilities, rather than a single factor "g" which does not provide specific information about specific intelligences (Flanagan, Genshaft & Harrison, 1997)



Self Check 3.2

- (a) Explain the "g" factor proposed by Spearman.
- (b) What was main criticism of the Stanford-Binet Test by David Wechsler?
- (c) Discuss the differences between Spearman's "g" factor and Thurstone's seven mental abilities in describing intelligence?

Visual Discrimination Test for Horses



These are patterns the authors used to investigate the ability of horses to discriminate which symbol of a pair was associated with a treat or food. The horses were presented with the patterns drawn on cards. The cards had the same smell so that the animals did not discriminate based on smell. Also, the cards did not have colour so as not to complicate the horses and prevent the animals discriminating based on colour.

[Source: D. Mader and E. Price, 1980. Discrimination Learning in Horses: Effects of Breed, Age and Social Dominance. *Journal of Animal Science*. 50: 962
<http://nicholnl.wcp.muohio.edu/DingosBreakfastClub/IQ/EquineSmarts.html>]

World War II

The U.S. Army Personal Research Office was responsible for the development, construction, validation and standardisation of all personnel screening test and interview techniques for the Army. The *Army General Classification Test* is the best-known product of the Office. Among other tests developed were mental alertness tests for the Women's Army Corps, aptitude tests for specialised training, performance tests and trade knowledge tests.

Raymond Cattell

Raymond Cattell (1905 – 1998) was also significantly involved in early attempts at psychological measurement] suggested that there are two related but distinct components of g:

- **Fluid intelligence** which is the ability to see relationships, as in analogies and letter and number series = primary reasoning ability

- **Crystallised intelligence** which is acquired knowledge and skills = factual knowledge

Fluid intelligence decreases with age and crystallised intelligence increases with age. Thus mathematicians and scientists, who need fluid intelligence, produce their best work in their 20s and 30s; whereas those in the field of history, philosophy and literature produce their best work in their 40s, 50s and beyond as they have accumulated more knowledge. Interestingly, poets, who depend more on fluid than crystallised intelligence, produce their best work earlier than prose authors: this has been observed in all cultures, languages and throughout history.

Guilford

Guilford (1967-1988) parted company from the majority of factorial theorists by refusing to acknowledge the existence of any general factor at all. Instead, he proposed that intelligence comprises 180 elementary abilities. The 180 elementary abilities are made up of a combination of three dimensions which he calls:

- Operations: what a person does (6-types)
- Contents: the material on which operations are performed (5-types)
- products:
- Form in which the information is stored and processes (6-types).

Guilford proposed that each combination of a specific operation, a specific type of content and a specific type of product defines a unique type of intelligence ($6 \times 5 \times 6 = 180$). In later versions of his theory he proposed even more types of intelligence.

Due largely to the practical implications of such a model, Guilford's theory has not significantly influenced psychological testing of intelligence.



Self Check 3.3

- (a) How does Cattell conceptualise intelligence?
- (b) Explain Guilford's conception of intelligence.

3.2 NATIONAL ASSESSMENT IN MALAYSIA

Measurement and evaluation in the Malaysian school system began during colonial times when the colonialists introduced an examination to select people to work as clerks, low level officers, supervisor and others work in the civil service. In 1956, the Razak Report was introduced which laid the foundation of the Malaysian education system. One of the recommendations of the Report was the introduction of a common examination system for all schools. In 1961 the Examination Syndicate was established to organise and manage national examinations for schools in Malaysia. The following is a chronology of events related to national examinations in Malaysian schools:

Primary School

- 1964 – The Standard VI Entrance Examination to secondary schools was abolished.
- 1967 – The Standard V Assessment Test was introduced and was later abolished.
- 1973 – The Standard III Diagnostic Test was introduced and was later abolished.
- In the 1980s the Primary School Assessment Examination (UPSR) was introduced which is taken by all Year 6 students before proceeding to secondary school.
- In the 1980s The First Level Assessment (PTS) was introduced to measure the ability of academically superior students to allow them to move from Year 3 to Year 5 which was later abolished.

Secondary School

- The Lower Certificate Examination was introduced (SRP) which was conducted at the end of Year 3 in secondary school. It was changed to Lower Secondary Assessment (PMR).
- In the last year of secondary school students sit for the Malaysian Certificate of Education (SPM).
- Students wishing to enter university complete two years of post-secondary school and sit for the Malaysian Higher Certificate of Education (STPM) examination.

3.3 TESTS, MEASUREMENT, EVALUATION AND ASSESSMENT

It is not surprising that many people are confused with the fundamental differences between *tests*, *measurement*, *evaluation* and *assessment* as they are used in education. Hope the following explanation of the three concepts will help clarify the confusion.

- **Tests:** Most people are familiar with tests because all of us at some time in our lives have taken some test. In school, tests are given to measure our academic aptitude and indirectly to evaluate whether we have gained from teaching by the teacher. In the workplace, tests are conducted to select persons for specific jobs, tests are used as the basis for promotion in the job and tests are used to encourage re-learning. Physicians, lawyers, insurance consultants, real-estate agents, engineers, civil servants and many other professions are required to take tests to demonstrate their competence in specific areas and in some cases to be licensed to practice their profession or



trade. Throughout their professional careers, teachers, counsellors, school administrators are required to give, score and interpret a wide variety of tests. For example, school administrators rate the performance of individual teachers, and school counsellors record the performance of their clients. It is possible that a teacher may construct, administer and mark thousands of tests during their career! According to the joint committee of the American Psychological Association (APA), the American Educational Research Association (AERA) and National Council on Measurement in Education (NCME), a the test may be thought of as a set of tasks or questions intended to elicit particular types of behaviours when presented under standardised conditions and to yield score that have desirable psychometric properties (1974). While most people know what is a test many have difficulty differentiating between measurement, evaluation and assessment. Some have argued that they are similar!

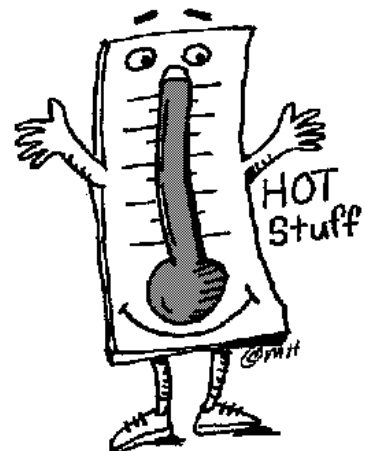
- **Measurement** is the act of assigning numbers to a phenomenon. In education it is the process by which the attributes of a person are measured and assigned numbers. Remember it is a process, indicating there are certain steps involved! As educators we frequently measure human attributes such as attitudes, academic achievement, aptitudes, interests, personality and so forth. Hence, to measure we have to use certain



instruments so that we can conclude that Ahmad is better in mathematics than Kumar while Tajang is more positive towards science than Kong Beng. We measure to obtain information about 'what is'. Such information may or may not be useful, depending on the accuracy of the instruments we use, and our skill at using them. For example, we measure temperature using a

thermometer, and so the thermometer is an instrument. How do you measure performance in mathematics? We use a mathematics test which is an *instrument* containing questions and problems to be solved by students. The number of right responses obtained is an indication of performance of individual students in mathematics. Note that we are only collecting information. We are not evaluating! Evaluation is therefore quite different from measurement.

- **Assessment and Evaluation:** The literature has used the terms 'assessment' and 'evaluation' in education as two different concepts and also used the two terms interchangeably, i.e. they are similar. For example, some authors used the term 'formative evaluation' while others use the term 'formative assessment'. We will use the two terms interchangeably because there is too much overlap in the interpretations of the two concepts. Generally, assessment is viewed as the process of collecting information with the purpose of making decisions about students. We may collect information using various tests, observations of students and interviews. Rowntree (1974) views assessment as a human encounter in which one person interacts with another directly or indirectly with the purpose of obtaining and



interpreting information about the knowledge, understanding, abilities and attitudes possessed by that person. For example, based on assessment information we can determine whether Chee Keong needs special services to assist him in developing reading skills or whether Khairul who was identified as dyslexic needs special attention. The key words in the definition of assessment is *collecting data and making decisions*. Hence, to make decisions one has to evaluate which is the process of making judgement about a given situation. When we evaluate, we are saying that something is good, appropriate, valid, positive, and so forth. To make an evaluation, we need information, and it is obtained by measuring using a reliable instrument. For example, you measure the temperature in the classroom and it is 30 degrees Celsius which is simply information. Some students may find the temperature too hot for learning while others may say that it is ideal for learning. At some during a day we are evaluating something or someone! Educators are constantly evaluating students and it is usually done in comparisons with some standard. For example, if the objective of the lesson is for students to apply Boyle's Law to the solution of a problem and 80% of learners are able to solve the problem, then the teacher may conclude that his or her teaching of the principle was quite successful. So, evaluation is the comparison of what is measured against some defined criteria and to determine whether it has been achieved, whether it is appropriate, whether it is good, whether it is reasonable, whether it is valid and so forth.



Self Check 3.4

- (a) Explain the differences between testing, measurement and assessment.
- (b) Discuss Guilford's conception of intelligence.

3.4 WHY DO WE ASSESS?

Let us begin by asking the question "Why do we as educators assess learners?". Some of us may find the question rather strange. The following may be a likely response:

Question: Why do you assess?

Answer: *Well, I assess to find out whether my students understand what has been taught.*

Question: What do you mean by 'understand'?

Answer: *Whether they can remember what I taught them and solve problems.*

Question: What do you do with the test results?

Answer: *Well, I give students the right answers and point out the mistakes made in answering the questions.*

The above could be the reason educators give when asked about the purpose of assessment. In the context of education, assessment is performed to gain an understanding of an individual's strengths and weaknesses in order to make appropriate educational decisions. The best educational decisions are based on information, usually better decisions are based on more information (Salvia and Ysseldyke, 1995). Based on the reasons for assessment provided by Harlen (1978) and Deale (1975), two main reasons may be identified (see Figure 3.5):

- to help the LEARNING, and;
- to improve TEACHING.

With regards the *learner*, assessment is aimed at providing information that will help make decisions concerning remediation, enrichment, selection, exceptionality, progress and certification. With regards *teaching*, assessment provides information regarding achievement of objectives, the effectiveness of teaching methods and learning materials.

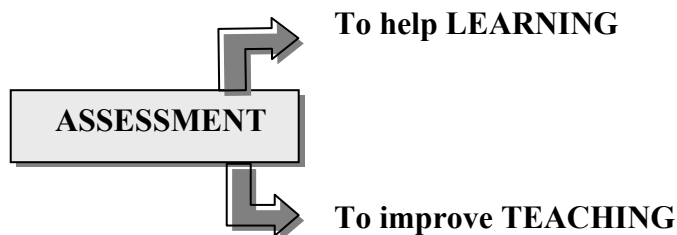


Figure 3.4: Purpose of assessment

A) TO HELP LEARNING

(i) Diagnosis

Diagnostic evaluation or assessment is performed at the beginning of a lesson or unit for a particular subject area to assess students' readiness and background for what is about to be taught. This pre-instructional assessment is done when you decide that you need information on a student, group of students or a whole class before you can proceed with the most effective instruction. For example, you could administer a Reading Test to Year One students to assess their reading level. Based on the information, you may want to assign weak



readers for special intervention or **remedial action**. Alternatively, the tests might reveal that some students are reading at an extremely high level and you might want to recommend that they be assigned to an **enrichment** programme (see Figure 3.2).

(ii) Exceptionality

Assessment is also conducted to make decisions on exceptionality. Based on the information obtained from assessment, teachers may make decisions as to whether a particular student needs to be assigned to a class with exceptional children. Exceptional students are students who are physically, mentally, emotionally or behaviourally different from the normal population. For example, based on assessment information a child may be discovered to be dyslexic and may be assigned for special treatment or a student who has been diagnosed to be learning disabled may be assigned for special education.



(iii) Certification

Certification is perhaps the most important reason for assessment. For example, the *Penilaian Menengah Rendah* and the *Sijil Pelajaran Malaysia* are examinations aimed at providing students with a certificate. The marks obtained are converted into letter grades signifying performance in different subject areas and used as a basis for comparison between students. The certificate obtained is further used in *selecting* students either for further studies, scholarships or jobs.

Types of Decisions	
Help Learning:	Questions to be Answered
Diagnosis for remedial action	Should the student be sent for remedial classes so that difficulty in learning can be overcome?
Diagnosis for enrichment	Should the student be provided with enrichment activities?
Exceptionality	Does the student have special learning needs that require special education assistance?
Selection	Should the student be streamed to X or Y?
Progress	To what extent is the student making progress toward specific instructional goals?
Communication to Parents	How is the child doing in school and how can parents help?
Certification	What is the strength and weakness in the overall performance of a student in specific areas assessed?
Administration & Counselling	<ul style="list-style-type: none"> • How is the school performing in comparison with other schools? • Why students should be referred for counselling?
Improve Teaching:	Questions to be Answered
Objectives	Were the desired learning outcomes achieved?
Teaching Method	Were the teaching methods employed effective?
Prior Knowledge	Did students have the relevant prior knowledge?
Teaching Materials	Were the teaching materials used effective?
Teacher Differences	Were particular teachers more effective than others?

Figure 3.5: Why do we assess?

(iv) Placement

Besides certification, assessment is conducted for purposes of placement. Students are endowed with varying abilities and one of the tasks of the school is to place them according to their aptitude and interest. For example, performance in the *Penilaian Menengah Rendah* is used as the basis for placing students in the arts or science stream. Assessment is also used to stream students according to academic performance. It has been the tradition that the 'A' and 'B' class will consist of high achievers based on the end of semester examinations or end of year examinations. Placement tests have even been used in pre-schools to stream children according to their literacy levels! The practice of placing students according to academic achievement has been debated for decades with some educationists arguing against it and others supporting its merits.

**Activity 3.2**

"Streaming according to academic abilities should be discouraged in Malaysian schools". Discuss

(v) Communicate to Parents

Families want to know how their child is doing in school, and family members appreciate specific examples of student progress. Showing examples of their child's work over time enables parents to personally assess the growth and progress of their child. It is essential to tell the whole story when reporting information about performance progress. Talking with families about standards, sharing student work samples, using rubrics in conferences, and differentiating between performance and progress are some ways to ensure that families are given an accurate picture of student learning.

**(vi) School Administration and Counselling**

Schools collect assessment information in order to determine how the school is performing in relation to other schools for a particular semester or year. Assessment results are also used to compare performance over the years for the same school. Based on the results, school administrators may institute measures to remedy weaknesses such as putting in more resources into students performing poorly such as the increasing number of students who are unable to read and write at a satisfactory level.

Assessment results (especially relating to socio-emotional development) may be used by school administrators and counsellors in planning intervention strategies for at-risk students. Assessment by counsellors will enable them to identify students presenting certain socio-emotional problems that require counselling services or referral to specialists such as psychiatrists, legal counsellors and law enforcement authorities.

B) TO IMPROVE TEACHING

If 70% of students fail in a test, do you investigate whether your teaching-learning strategy was appropriate or do you attribute it your students being academically weak or they did not revise their work? Most educators would attribute the poor performance to the latter. See Figure 1.2. Assessment information is valuable in indicating which of the learning outcomes have been successfully achieved and which instructional objectives students had most difficulty with. Assessment results are valuable in providing clues as to the effectiveness of the teaching strategy implemented and teaching materials used. It also indicates whether students had the required prior knowledge to grasp the concepts and principles discussed. Assessment data may also provide insight into why some teachers are more successful in teaching a particular group of students while others are less successful.



Activity 3.3

To what extent have you used assessment data to review your teaching-learning strategies?

3.5 TYPES OF ASSESSMENT

Before we proceed to discuss in detail about assessment in the next chapters, you need to be clear about these often used concepts in assessment:

- Formative assessment (or evaluation) and Summative assessment (or evaluation)
- Criterion-referenced assessment and Norm-referenced assessment

A) FORMATIVE vs. SUMMATIVE ASSESSMENTS

Assessment can be done at various times throughout the school year and a comprehensive assessment plan will include both formative and summative assessment. The *point* at which assessment occurs and the *aim* of assessing distinguishes these two categories of assessment.

- Formative Assessment:** Formative assessment is often done at the beginning or during the school year, thus providing the opportunity for immediate evidence for student learning in a particular subject area or at a particular point in a programme. Classroom assessment is one of the most common formative assessment techniques. The purpose of this technique is to improve quality of student learning and should not be evaluative or involve grading students (see Figure 1.3). In formative assessment the teacher compares the performance of a student to the performance other students in the class and not all students in the same year (or form). Usually, a small section of the content is tested to determine if the objectives have been met. Formative assessment is action-oriented and forms the basis for improvement of instructional methods (Scriven, 1996).

	Formative Assessment	Summative Assessment
Timing	Conducted throughout the teaching-learning process	Conducted at the end of a teaching-learning phases (e.g. end of semester or year)
Method	Paper & pencil tests, observations, quizzes, exercises, practical sessions administered to the group and individually	Paper & pencil tests, oral tests administered to the group
Aim	<ul style="list-style-type: none"> To assess progress and recommend remedial action for non-achievement of objectives Remediation or enrichment or reteach the topic 	<ul style="list-style-type: none"> Grading to determine if the programme was successful. To certify students and improve the curriculum
Example	Quizzes, essays, diagnostic tests, lab reports and anecdotal records	Final exams, national examinations, qualifying tests.

Figure 3.6: Differences between formative and summative assessment

For example, if a teacher observes that some students do not grasp a concept, he or she may design a review activity or use a different instructional strategy. Likewise, students can monitor their progress with periodic quizzes and performance tasks. The results of formative assessments are used to modify and validate instruction. In short, formative assessments are on-going and include reviews, and observations of what is happening in the classroom.

- **Summative Assessment:** Summative assessment is comprehensive in nature; provides accountability and is used to check the level of learning at the end of the programme (which may be at the end of the semester, year or after two years). For example, after three years in secondary school, students take the *Penilaian Menengah Rendah*, which is summative in nature since it is based on the cumulative learning experiences of students. Summative assessments are typically used to evaluate the effectiveness of an instructional programme at the end of an academic year or at a pre-determined time. The goal of summative assessments is to make a judgment of student competency—after an instructional phase is complete. For example, in Malaysia national examinations are administered each year. It is a summative assessment to determine each student's acquisition of several subject areas of between 2 to 3 years coverage of content. Summative evaluations are used to determine if students have mastered specific competencies and letter grades are assigned to assess learner achievement.

“When the cook tastes the soup, that’s *formative* evaluation; when the guests taste the soup, that’s *summative* evaluation”

- Robert Stakes

B) NORM-REFERENCED vs CRITERION-REFERENCED TESTS

The main difference between Norm-referenced tests and Criterion-referenced tests depends on the purpose or aim of assessing your students, the way in which content is selected and the scoring processes which defines how the test results must be interpreted.

- **Norm-Referenced Tests:** The major reason for norm-referenced tests is to classify students. These tests are designed to highlight achievement differences between and among students to produce dependable rank order of students across a continuum of achievement from high-achievers to low achievers (Stiggins, 1994). With norm-referenced tests, a representative group of students is given the test and their scores form the norm after having gone through a complex administration and analysis. Anyone taking the norm-referenced test can compare his or her score against the norm. For

example, a student who obtained a score of 70 on a norm-referenced will not mean much until it is compared to the norm. When compared to the norm, her score is the 80th percentile which means that she performed as well or better than 20% of students in the norm group. This type of information can be useful for deciding whether or not students need remedial assistance or is a candidate for the gifted programme. However, the score gives little information about what the student actually knows or can do. A major criticism of norm-referenced tests is that they tend to focus on assessing low level, basic skills (Romberg, 1989).

	Norm-Referenced Test	Criterion-Referenced Tests
Aim	<ul style="list-style-type: none"> • Compare a student's performance with other students • Select students for certification 	<ul style="list-style-type: none"> • Compare a student's performance against some criteria • Extent to which student has acquired the knowledge or skill • Improve teaching & learning
Types of Questions	Questions from simple to difficult	Questions of nearly similar difficulty relating to the criteria
Reporting of results	Grades are assigned	No grades are assigned (whether skill or knowledge achieved or not)
Content coverage	Wide content coverage	Specific aspects of the content
Examples	UPSR, PMR, SPM national examinations, end of semester examinations, end of year examinations	Class tests, exercises and assignments

Figure 3.7: Differences between norm-referenced and criterion tests

- **Criterion-Referenced Tests:** Criterion-referenced tests determine what students can or cannot do, and not how they compare to others (Anastasi, 1988). Criterion-referenced tests report how well students are doing relative to a pre-determined performance level on a specified set of educational goals or outcomes included in the curriculum (see Figure 3.4). Criterion-references tests are used when teachers wish to know how well students have learned the knowledge and skills which they are expected to have mastered. This information may be used as one piece of information to determine how well the student is learning the desired curriculum and how

well the school is teaching that curriculum. Criterion-referenced tests give detailed information about how well a student has performed on each of the educational goals or outcomes included on that test. For instance, a criterion-referenced test score might describe which arithmetic operations a student can perform or the level of reading difficulty experienced.



Self Check 3.5

- (a) Explain the differences between norm-referenced and criterion-referenced tests.
- (b) List the main differences between formative and summative assessment.

3.6 TRENDS IN ASSESSMENT

Easing up on Exams

Putrajaya: Reducing the number of examination subject and having a semester system are among the major changes being planned to make the education system more holistic and less focussed on academic achievement.

Education Minister, Datuk Seri Hishamumuddin Tun Hussein said that these measures were in line with the Government's aim to reform the country's education system. "We do not intend to abolish public or school-level examinations totally, but we recognise that the present assessment system needs to be looked at", he said.

Among the measures proposed are:

- Reduce the number of subjects in public examinations
- Emphasising skills and abilities rather than focusing on content and achievement
- Encouraging personal development through subjects like Art and Physical Education
- Improving teaching-learning methods by encouraging more project-based assignments

He said that emphasis should be on individual accomplishments rather than the school's performance in public examinations and also highlighting the individual's co-curricular achievements.

[Star, 21 March, 2006]



Activity 3.4

Refer to the report on 'Easing up on Exams'

- (a) To what extent do you agree with the measures proposed by the Ministry of Education to reduce the exam-oriented education system?
- (b) Suggest other possible measures.

In the last two decades, major changes have occurred in assessment practices in many part of the world. Brown, Bull and Pendlebury (1997) identified the following trends happening in educational assessment:

- Written examinations are gradually being replaced by more continuous assessment and coursework
- There is a move towards more student involvement and choice in assessment.
- Group assessment is becoming more popular in an effort to emphasise collaborative learning between students and to reduce excessive competition.
- Subject areas and courses state more explicitly about the expectations in assessment. It is more clearly the kinds of performance required from students when they are assessed. This is unlike earlier practice where assessment is so secretive and students had to figure out for themselves what was required of them.
- An understanding of process is now seen as, at least, equally important to a knowledge of facts. This is in line with the general shift from product-based assessment towards process-based assessment.
- Student focussed 'learning outcomes' have begun to replace teacher oriented 'objectives'. The focus is more on what the student will learn rather than what the teacher plans to teach.

SUMMARY

- Early evidence of educational testing was conducted in China, called the Imperial Examination system or *keju* system.
- The imperial examinations were virtually the only path for common people to enjoy a privileged life if they passed.
- Galton argued that human mental abilities and personality traits are essentially inherited.
- In 1905 Alfred Binet produced the Binet-Simon scale (with Theodore Simon) which required subjects to perform 30 short reasoning tasks.
- Lewis Terman revised the Binet-Simon test by adapting some items, adding other items and establishing new age norms, and extended the upper age limit to "superior adults". This became the Stanford-Binet revision in 1916.
- A test may be thought of as a set of tasks or questions intended to elicit particular types of behaviours when presented under standardised conditions and to yield score that have desirable psychometric properties.
- Measurement in education is the process by which the attributes of a person are measured and assigned numbers.
- Assessment is viewed as the process of collecting information with the purpose of making decisions about students.
- Assessment is aimed to help the learner and improve teaching.
- Summative assessment is comprehensive in nature; provides accountability and is used to check the level of learning at the end of the programme.
- Formative assessment is often done at the beginning of during the school year, thus providing the opportunity for immediate evidence for student learning in a particular subject area or at a particular point in a programme.
- The major reason for norm-referenced tests is to classify students. These tests are designed to highlight achievement differences between and among students to produce dependable rank order of students.
- Criterion-referenced tests determine what students can or cannot do, and not how they compare to others.

KEY TERMS

Imperial examination	Primary mental abilities	Assessment
Psychometrics	Crystallised intelligence	Evaluation
Binet-Simon scale	Fluid intelligence	Criterion-referenced
Intelligence Quotient	Summative assessment	Norm-referenced
“g” Factor	Measurement	Formative assessment



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Chapter 4 ▶ The Educational Research Process

CHAPTER LEARNING OUTCOMES

When you have completed this chapter you will be able to:

1. Identify the different methods of acquiring knowledge;
2. Define what is educational research;
3. Discuss the importance of educational research and its characteristics;
4. Identify the criteria of research;
5. Describe the steps involved in the research process;
6. Identify a research problem; and
7. List the criteria of a good research problem.

CONTENT

- 4.1 What is Educational Research?
 - 4.2 Methods of Acquiring Knowledge
 - 4.3 Research Defined
 - 4.4 Characteristics of Research
 - 4.5 The Research Process
 - 4.5.1 Generating Research Ideas
 - 4.5.2 Formulate the Research Problem
 - 4.5.3 Develop Hypotheses or Research Questions
 - 4.5.4 Design Study to Test Hypotheses or Research Questions
 - 4.5.5 Collect Data
 - 4.5.6 Analyse and Interpret Data
 - 4.5.7 Communicate Results
 - 4.6 Constructs and Variables
- Summary
Key Terms
Discussion Questions
References

4.1 WHAT IS EDUCATIONAL RESEARCH?

What is educational research? Generally, educational research is defined as research that investigates the behaviour of students, teachers, administrators, parents and other members of the community who interact with educational institutions. The word behaviour is taken broadly to mean such phenomena as learning, attitudes, aptitudes, abilities, interests, practices, processes, emotions and so forth. Research is a way of thinking; it involves thinking **about** what we want to study, how we go about collecting data, analysing the data and deriving conclusions.



What is the purpose of educational research? Since education is fundamentally the development of individuals then the central purpose of educational research is to find ways to improve student learning. It has been argued that educational research that does not have this as its ultimate motivation and objective is not educational research. Anyone who is engaged in a systematic search of ways to improve student learning is doing educational research. For example, a classroom teacher experimenting with alternative ways of explaining laws of physics and a full-time researcher comparing the effectiveness of different reading methods in early literacy programmes are both engaged in a search for ways to improve student learning, and, in this sense, are both engaged in educational research. The leadership styles of the school principal will influence teacher morale and job satisfaction which will translate to how teachers behave in the classroom. So, the behaviour of school principals and headmasters can influence student learning and attitudes.



Activity 4.1

1. Do you agree with statement “*..the central purpose of educational research is to find ways to improve student learning*”?
2. Give some examples of findings from educational research in your area of interest.

4.2 METHODS OF ACQUIRING KNOWLEDGE

Over the centuries, humans have accumulated vast amount of knowledge and the amount of knowledge produced is doubling every two years. There are many ways in which we obtain knowledge about a given phenomenon, event or situation. There are six ways in acquiring knowledge and they are; through our beliefs, intuition, authority, empiricism, rationalism and science (see Figure 4.1)

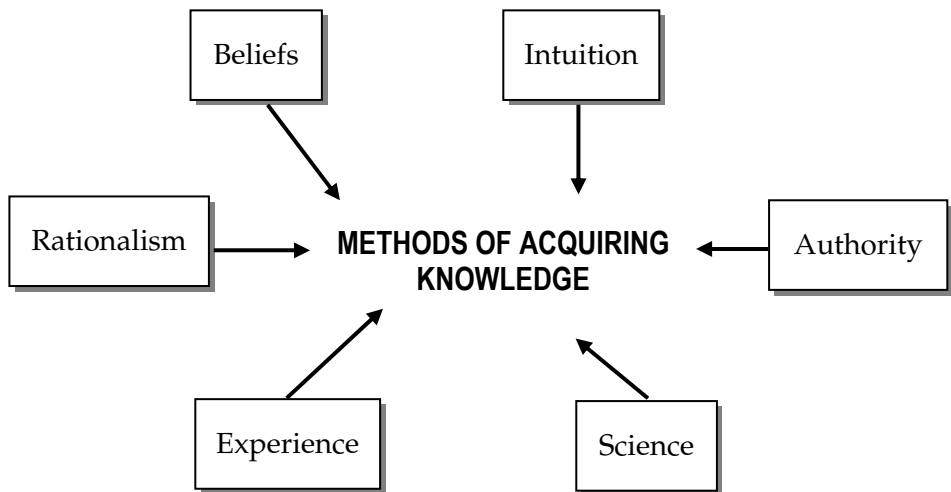


Figure 4.1: Methods of Acquiring Knowledge

Source: Adaptation of G.C. Helmstadter, *Research concepts in human behaviour*.
New York: Appleson-Century-Crofts]

- **Beliefs:** These are all superstitious beliefs people hold on to as though they are fact. For example, wear your a lucky shirt when making deals which you strongly believe will bring you good fortune.
- **Intuition:** An approach in acquiring knowledge that is not based on reasoning or inferring. Intuitive knowledge is not scientific but is knowledge that originates from gut feeling or predictions by soothsayers, astrologers and fortune-tellers.
- **Authority:** Knowledge that originates from persons or sources that are highly respected. For example, various religions have a sacred text that represents the facts, which are considered indisputable, final and cannot be challenged.

- **Experience:** This approach of acquiring knowledge is based on the statement which says, “If I have experienced it, then it is valid and true”. In other words, only facts that are in agreement with experience are accepted, and those that do not are rejected. However, reliance on experience has its shortcomings because our perceptions of people, events and objects are affected by many factors. For example, we constantly add, delete and reconstruct our experiences.
- **Rationalism:** This approach uses reasoning to arrive at knowledge and assumes that valid knowledge is acquired through correct reasoning. Ancient philosophers believed that knowledge derived from reasoning was just as valid as knowledge gained from observation. Reasoning is regarded as the beginning of the scientific process where hypotheses are proposed.
- **Science:** It is a process that is followed in generating knowledge and has been accepted as the best method of acquiring knowledge. It lists a series of steps to be followed when acquiring knowledge using the scientific method. However, it has been argued that strictly following the scientific method prevents us from studying in depth human behaviour.



Activity 4.2

1. Identify the different methods by which we acquire knowledge. Give specific examples for each method.
2. Which method has contributed most towards our understanding of how children learn? Give specific examples.

4.3 RESEARCH DEFINED

According to the Webster’s dictionary, research is diligent scientific search or inquiry to discover facts. The Wikipedia encyclopaedia describes research as an active, diligent and systematic process of inquiry in order to discover, interpret or revise facts, events, behaviours or theories. Kerlinger defines research as “the systematic, controlled, empirical and critical investigation of natural phenomena guided by theory and hypotheses about the presumed relations among the phenomena” (p.10). You will notice certain key words in these definitions of research:

- | | |
|----------------------------|----------------------|
| • Scientific | • Controlled |
| • Systematic process | • Theory, hypotheses |
| • Inquiry or Investigation | • Presumed relations |
| • Discover | • Natural phenomena |

It is a scientific (or systematic) process of gathering information about the hypothesised relations between phenomena. For example, to investigate if there is a relationship between a student's attitude towards mathematics and his or her performance in mathematics. The *scientific method* was popularised by John Dewey in 1933 and lists the following steps:

- 1) Formulation of a hypothesis (a tentative statement about the relation between two or more theoretical constructs. e.g. attitude and mathematic performance)
- 2) Test the hypothesis (design a study to establish whether the relationship between the constructs are as hypothesised)
- 3) Collect data (e.g. collect data on attitude towards mathematics and mathematics performance)
- 4) Decide to accept or reject the hypothesis (e.g. correlation between attitudes towards mathematics and mathematics performance)

The purpose of using the scientific method is to enable the researcher to *describe* (the relations between factors); to *predict* (given what is known we can we predict what might happen); to *control* (when certain variables are manipulated, does it lead to a particular condition), and to *explain* (can a theory be formulated to explain the phenomena being investigated).

4.4 CHARACTERISTICS OF RESEARCH

Research is a way of thinking and to qualify as a research it needs to have certain characteristics such as follows (adaptation of Leedy, 1993, Borg & Borg, 1983, Mitchell & Jolley, 1988).

- 1) **Research begins with a question in the mind of the researcher.**
You need only to look around and everywhere you see phenomena which will arouse your curiosity. For example, why are children in this school unable to read? Why are girls performing better than boys? These are situations in which the meaning of which you do not comprehend. By

asking relevant questions we create an inquisitive environment which is the prerequisite for research. Research arises from a question that is intelligently asked with regards to a phenomenon that the researcher observes and is puzzling him or her.

- 2) **Research requires a plan.**
One does not discover the truth or explanations about a phenomenon without serious and meticulous planning. Research is not looking-up something in the hope of coming across the solution to your problem. Rather it entails a definite plan, direction and design.
- 3) **Research demands a clear statement of the problem.**
Successful research begins with a clear, simple statement of the problem. The statement of the problem should be stated precisely and grammatically complete, must set forth what it seeks to discover and enables one to see what one is attempting to research.
- 4) **Research deals with the main problem through subproblems.**
Divide the main problem into appropriate subproblems, all of which when resolved will result in the solution of the main research problem.
- 5) **Research seeks direction through appropriate hypotheses.**
Having stated the problem and the related subproblems, the subproblems are then each viewed through logical constructs called hypotheses. A hypothesis is a logical supposition, a reasonable guess, an educated conjecture which may give direction to thinking with respect to the problem, and thus, aid in solving it.
- 6) **Research deals with facts and their meaning.**
Having defined the problem, the subproblems and hypothesis, the next step is to collect whatever facts pertinent to the problem. Organise the data collected into a form that is potentially meaningful.



Self Check 4.1

1. Define research in your own words.
2. Identify the steps that are followed in gaining knowledge through the use of the scientific method.
3. What are the four objectives of science attempting to accomplish?
4. What are some characteristics of research?

4.5 THE RESEARCH PROCESS

As discussed earlier, research is a systematic process which means there are definite steps involved. Figure 1.1 lists the seven steps involved in the research process.

4.5.1 Generating Research Ideas

For many beginning researchers and graduate students “the problem of finding a problem” can be difficult. There are cases of graduate students who have completed all coursework requirements and “get stuck” at the thesis stage and some never graduate. Hence, it is advisable that students search for a suitable problem early which they can explore throughout their coursework. The word ‘problem’ means there is dispute, controversy, debate or disagreement that needs to be addressed, solved or answered. For example, why do young learners have difficulty with multiplication and division operations compared to addition and subtraction operations in mathematics.

Where does one find research problems in education? They are all around you! There are abundant research problems or unresolved issues everywhere. Look at the 14 year old who says, “I hate history”. Do you know why? Do you want to know why? In fact, whatever that arouses your interest for which there are as yet no answers or are inconclusive have the potential of being a research problem. Often one starts with a rather general, diffuse and even confused notion of the problem. Do not worry, this is the nature and complexity of research process. It is the first step towards becoming a mature researcher. The following steps are to help you get a research problem (see Figure 4.2).

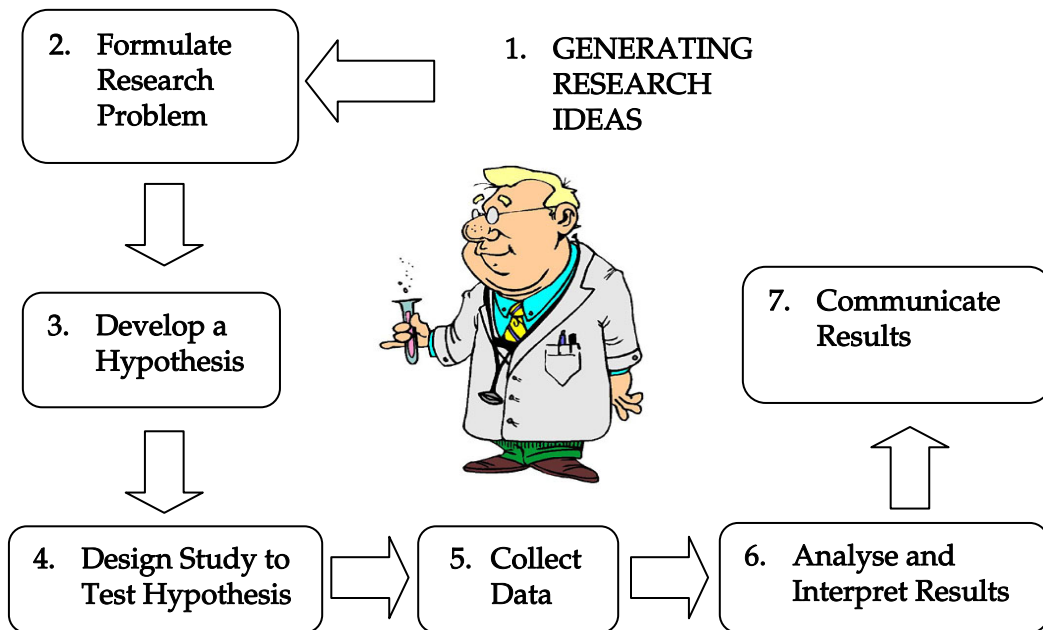


Figure 4.2: The Seven Steps of the Research Process

- Step 1: Identify a Broad Problem in Your Area** that is of interest to you and related to your professional goals. You should build a sizable knowledge in your area of interest that is for the long term. For example, you may be interested in how young children learn mathematics, how to get teenagers interested in science, how to enhance the teaching of moral education, how to improve training in the corporate sector using e-Learning, the relationship between headmasters' leadership style and teacher morale, and so forth.
- Step 2: Systematic Programme of Reading** within your broad area of study. For example if you are interested in why children have difficulty in learning mathematics, you could start with textbooks in the area or chapters of textbooks. Textbooks explain the basic concepts and facts related to the issue and may cite research in the area which will be listed in the 'references' which you could further explore. Journals such as the *Review of Research in Education* and *Review of Educational Research* provide valuable information about a particular field as they review related literature. Next is to read articles in the relevant journals in the field. For example if you are interested in reading research then you should read "Journal of Reading" and the "Reading Research Quarterly". You should look through the catalogue both in the library and on-line and identify the

journals in your field. Students do not adequately refer to journals in the field but instead tend to cite from popular sources such as newspapers, magazines and speeches. Journals report empirical evidence about the field you are interested in and they indicate the current thinking about research and the trend of research efforts in the field. This will give you a grasp of leading edge research in the United States, Britain, Europe and Australia and how you might do the same in Malaysia.

- **Step 3: Relate Your Research Problem to a Theory** in the field. A theory is an explanation of events or phenomena or behaviour. For example, if you are interested in finding out whether providing children with multimedia presentations explaining science concepts will enhance understanding, you may want to explore the underlying theories of visual learning. Many phenomena in education are explained drawing upon theories from cognitive psychology, sociology, psycholinguistics, management, computer science and so forth. It should be remembered that theory provides the direction of the research [we will discuss in more detail the role of theory in Chapter 2].



Self Check 4.2

1. How do you go about finding a research problem in education?
2. What other sources provide research problems in education?

4.5.2 Formulate the Research Problem

Upon having a broad idea of what you want to investigate, the next step is to formulate the problem simply, clearly and completely. This is what we mean by '*statement of the problem*'. An adequate statement of the research problem is an important step in the research process. Obviously, if you want to solve a problem, you must know what is the problem. What is a good problem statement? Although research problems differ greatly, and although there is no one "right" way to state one, certain characteristics of problems and problem statements can be learned and used to good advantage.

Example: The relationship between self-esteem, attitudes toward science and academic performance in science.

This is an example of a research problem stating the relation between three factors or variables (self-esteem, attitudes and academic performance). A problem is an interrogative sentence or statement that asks: What relation exists between the variables? The answer to this question will be sought by conducting the research.

Three Criteria of Good Problem Statements

- 1) The problem should **express a relation between two or more variables**
 Is A related to B?
 How are A and B related?
 How is A related to B under condition C?
 Is there a difference between A and B in terms of C?
- 2) The problem should be **stated clearly and unambiguously** preferably in question form. Instead of saying, "The problem is", or The purpose of this "study is...."; ask a question. Questions have the advantage of posing problems directly. The purpose of a study is not necessarily the same as the problem of the study. For example, the purpose of the study was to throw light on the relationship between academic performance and self-esteem. The problem stated as a question: *Is self-esteem related to academic performance?*
- 3) The problem should be such as to **imply possibilities of empirical testing**. A problem that does not contain implications for testing its relationship or relations is not a scientific problem. So, if you can measure the constructs self-esteem and academic performance, then the problem is considered a good problem.



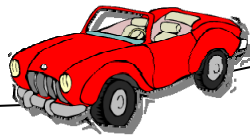
Self Check 4.3

1. What is a good problem statement?
2. Why do graduate students have difficulty in stating research problems?

4.5.3 Develop Hypotheses or Research Questions

Your car will not start. You put forward the hypothesis that "the car that does not start because there is no petrol". You check the fuel gauge to either reject or accept the hypothesis. If you find there is petrol, you reject the hypothesis.

Next, you hypothesise that "the car did not start because the spark plugs are dirty". You check the spark plugs to determine if they are dirty and accept or reject the hypothesis accordingly.



Similarly, in educational research you have to put forward hypotheses or research questions that states a relationship between the variables or constructs you are studying. After having established the research problem or area that you plan to investigate, the next step is to breakdown the problem into subproblems called hypotheses or research questions. A hypothesis or research question is an "educated guess" or a hunch about possible relationships or differences. The hypothesis or research question guides the selection of appropriate research method, data collection techniques, data analysis techniques (e.g. the statistical analysis to be used) and so forth.

Hence, hypotheses or research questions have to be clearly stated and you should be prepared to defend or support your choice of hypotheses or research questions. For example, you hypothesise that "Students taught science using a problem-based approach will more creative". You are seeking to confirm empirically that the problem-based approach in science teaching will enhance creativity of learners.

4.5.4 Design Study to Test Hypotheses or Research Questions

Having determined the hypotheses or research questions, the next step is to design the study. We often hear of graduate students saying they want to do an 'experiment' or a 'survey'. But, they are unable to state with clarity and precision the hypotheses or research questions they intend to answer. It is like 'putting the cart before the horse'. The hypotheses or research questions determines the design of the study. If you intend to test the effectiveness of an educational

phenomenon such as a teaching method or a counselling technique, the logical choice would be to design an experiment. If you intend to find out whether teachers are satisfied with their profession or how they perceive their principals, than the survey would be the appropriate research design. If your intention is to study inter-racial mixing among students in the school canteen, than a qualitative approach using the observation technique might be more appropriate.



Activity 4.4

The following are research problems taken from the research literature. Study them carefully and construct one or two hypotheses or research questions based on them.

- How do self-esteem and level of aspiration influence academic achievement?
- Does providing learners with graphic organisers enhance their understanding of science text material?
- How does the organisational climate in schools affect teacher satisfaction and morale?

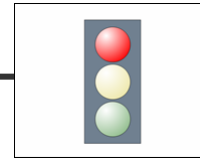
Hence, the decision on which methodology to use will depend on the research problem and the research questions or hypotheses. It is not good practice to decide on a methodology and then work on the research questions. You have to be able to state clearly what you intend to study and then decide on an appropriate methodology. If you are clear about your research problem and research questions, you will find it easy get assistance from your supervisor and other students in designing a study to find answers to your research questions.

4.5.5 Collect Data

The research question determines the design of the study and method of data collection to answer the question. Say for example, one of your research questions is determine whether there are differences in self-esteem between male and female 16 year old students in secondary school. To answer this question you have to collect data on the self-esteem of students. This may be done by developing a self-esteem instrument (or using an available instrument) and administering it to a sample of secondary school students. The sample will have to be representative of 16 year old students in secondary school to allow you to generalise the results obtained to the population. Here you are using quantitative data collection methods.



Activity 4.5



You have stopped at a junction because the lights had just turned red. But, on your left a motorcyclist and a car beat the lights. You are most annoyed. Being a good social scientist, you ask yourself why people beat traffic lights. If you were to convert the problem into a hypothesis, which of the following would be the *best* hypothesis? Explain your answer.

- (a) Some people beat traffic lights more frequently than others.
- (b) People who beat traffic lights are a danger to themselves and other road users.
- (c) Beating traffic lights is common in crowded cities.
- (d) Road users are more likely to beat traffic lights when traffic is light than if traffic is heavy.

On the other hand, if you are interested in studying student-teacher interaction, you may have to spend time in classrooms. You can use a structured observation checklist or leave it open-ended and record all the processes that occur in the classroom. Here you are using qualitative data collection methods.

4.5.6 Analyse and Interpret Data

The data collected from subjects (e.g. students, teachers, school administrators and others) will have to be analysed. If your study involves quantitative data then statistical procedures will be used to analyse the data. The analysed data is usually presented as tables and graphs. Based on the statistical analysis, the researcher interprets the data in relation to the research questions or hypotheses. In the case of qualitative data, information is coded and presented anecdotally. Instead of numbers, data is presented in the form of words and sentences. Similarly, the data is interpreted in relation to the research questions or objectives of the study.

4.5.7 Communicate Results

Data that has been analysed and interpreted will have to be communicated to the community of fellow researchers and practitioners. The results of a study are most commonly communicated to interested parties through journals. There are numerous journals in education reporting the findings of studies in the many fields of education (e.g. early childhood, reading, second language learning,

educational psychology, adolescents, mathematics teaching and so forth). If you are a graduate student, you will most probably be communicating the results of your study in the form of a thesis or dissertation or even a research practicum. There is an established format of presenting the findings of your study which will be discussed in detail in Chapter 10.



Activity 4.6

1. Identify a research problem that you are interested in investigating.
2. Formulate TWO research questions or hypotheses based on the research problem.

4.6 CONSTRUCTS AND VARIABLES

A construct is deliberately and consciously invented or adopted for a special scientific purpose. "Intelligence" is construct based on observation of presumably intelligent and less intelligent behaviours or having a value of more or less. Constructs are used in theoretical schemes and **are** related in various ways to other constructs. e.g. school achievement is in part a function of intelligence. Intelligence is so defined and specified that it can be observed and measured. e.g. administering intelligence tests, interview teachers about their students.

Researchers somewhat loosely call constructs or properties they study as 'variables'. eg. gender, social class. **A variable is something that varies. A variable is a symbol to which numerals of values are assigned.** For example, the symbol "intelligence" is assigned a set of numerical values which may be IQ scores ranging from 50 to 150. In the case of the variable "gender" there are only 2 values and they are called **dichotomous variables**, i.e. male (1) and female (0). Other examples of two-value variables are: graduate-nongraduate, low income-high income, citizen-noncitizen. Besides dichotomous variables, some variables are polytomies, eg. religion - Islam, Christianity, Buddhism, Hinduism, etc

There are many ways of classifying variables but in educational research, the two most common methods of classification are as follows:

- Independent and Dependent Variables
- Continuous and Categorical Variables

(a) **Independent and Dependent Variables**

An independent variable (IV) is the variable that is presumed to cause a change in the dependent variable (DV). The independent variables is the antecedent while the dependent variable is the consequent. See Figure 1.3 which describes a study to determine which teaching method (independent variable) is effective in enhancing the academic performance (dependent variable) of students.

- The **independent variable** (teaching method) can be manipulated 'Manipulated' means the variable can manoeuvred, and in this case it is divided into 'discussion method and 'lecture method'. Other examples of independent variables are gender (male-female), race (Malay, Chinese, Indian), socioeconomic status (high, middle, low). Other names for the independent variable are treatment, factor and predictor variable.
- The **dependent variable** in this study is academic performance which cannot be manipulated by the researcher. Academic performance is a score and other examples of dependent variables IQ (score from IQ tests), attitude (score on an attitude scale), self-esteem (score from a self-esteem test) and so forth. Other names for the dependent variable are outcome variable, results variable and criterion variable.

Put it another way, the DV is the variable predicted *to*, whereas the independent variable is predicted *from*. The DV is the presumed effect, which varies with changes or variation in the independent variable.

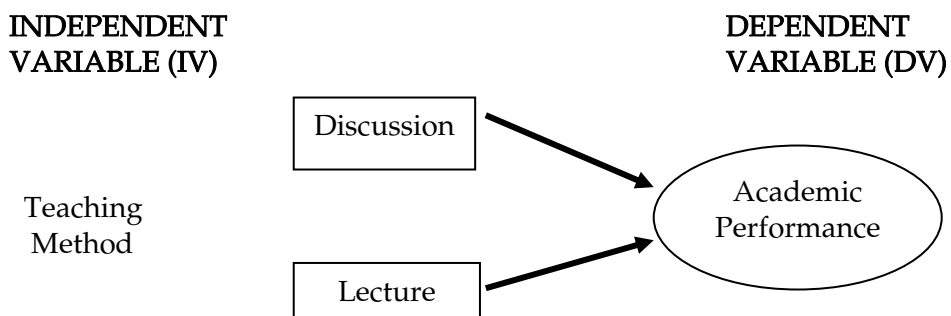


Figure 4.3: Independent and Dependent Variable

(b) **Continuous and Categorical Variables**

A **continuous variable** (also called ordinal variable) is capable of taking on an ordered set of values within a certain range. For example, an attitude scale towards smoking may have values ranging from 5 to 20 which

expresses differing amounts of attitude towards smoking. A **categorical variable** (also called nominal variables) may be made up of two or more subsets or categories. Each subset or category possess certain characteristics and individuals are categorised by their possession of those characteristics that defines a subset. For example, the variable socio-economic class (SES) may consist of 3 values such as high SES, middle SES and low SES.

(c) **Operational Definition of Variables**

“If you lead a good life, you will not suffer”. This is a specific prediction of the future, but it cannot be scientifically tested. Such a prediction is not scientifically tested because we cannot define it operationally. How do you define ‘good life’ and how do you define ‘suffer’. According to Bridgman, 1927, **operational definition** means that variables used in the study must be defined as it is used in the context of the study and publicly observable. This is done to facilitate measurement and to eliminate confusion.

For example, when you state in your study that you are studying 'excellent principals, you should be able to explain what 'excellent' means. Once the behaviours of an excellent principal have been identified the operational definition will be unique to your study (see Figure 4.4).

However, it should be borne in mind that in education not all variables are directly observable. For example, we cannot really observe learning, memory, reasoning, and so forth. Though they cannot be observed they can be measured to see their traces. With enough indirect evidence, researchers can make a convincing case for the existence of these invisible variables (Mitchell and Jolley, 1988). For example, though we cannot observe learning directly, we can see its effect on performance, i.e. we can operationally define learning as an increase in performance. Thus, if we see students improve their performance after practicing a task, we conclude that learning has occurred. Similarly, we can provide operational definitions for such intangible variables such as self-esteem, racial stereotype, attitudes and so forth.

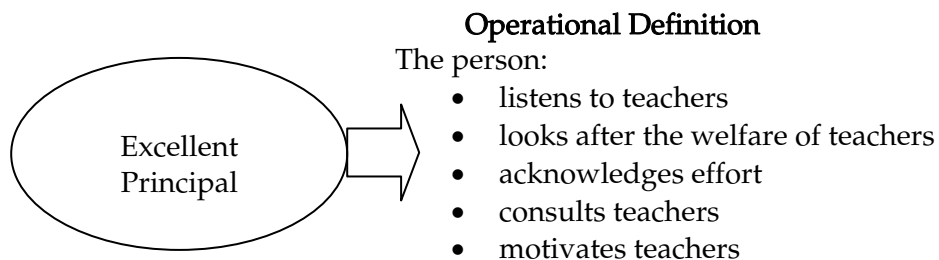


Figure 4.4: Example of an Operational Definition of an Excellent Principal



Self Check 4.4

1. What is a variable?
2. What is the difference between an Independent Variable and Dependent Variable? Give specific examples.
3. Why do you need to define variables operationally?

Example of operational definition: Engaged Learning

Source: www.ncrel.org/sdrs/edtalk/newtimes.htm

Indicators of Engaged Learning

Variable	Indicator of Engaged Learning	Indicator Definition
Vision of Learning	Responsible for learning Strategic Energized by learning Collaborative	Learner involved in setting goals, choosing tasks; has big picture of learning and next steps in mind Learner actively develops repertoire of thinking/ learning strategies Learner is not dependent on rewards from others; has a passion for learning Learner develops new ideas and understanding in conversations and work with others
Tasks	Authentic Challenging Multidisciplinary	Pertains to real world, may be addressed to personal interest Difficult enough to be interesting but not totally frustrating, usually sustained Involves integrating disciplines to solve problems and address issues
Assessment	Performance-based Generative Seamless and ongoing Equitable	Involving a performance or demonstration, usually for a real audience and useful purpose Assessments having meaning for learner; maybe produce information, product, service Assessment is part of instruction and vice versa; students learn during assessment Assessment is culture fair
Instructional Model	Interactive Generative	Teacher or technology program responsive to student needs, requests (e.g., menu driven) Instruction oriented to constructing meaning; providing meaningful activities/experiences

Learning Context	Collaborative Knowledge-building Empathetic	Instruction conceptualizes students as part of learning community; activities are collaborative Learning experiences set up to bring multiple perspectives to solve problems such that each perspective contributes to shared understanding for all; goes beyond brainstorming Learning environment and experiences set up for valuing diversity, multiple perspectives, strengths
Grouping	Heterogeneous Equitable Flexible	Small groups with persons from different ability levels and backgrounds Small groups organized so that over time all students have challenging learning tasks/experiences Different groups organized for different instructional purposes so each person is a member of different groups; works with different people
Teacher Roles	Facilitator Guide Co-learner/co-investigator	Engages in negotiation, stimulates and monitors discussion and project work but does not control Helps students to construct their own meaning by modeling, mediating, explaining when needed, redirecting focus, providing options Teacher considers self as learner; willing to take risks to explore areas outside his or her expertise; collaborates with other teachers and practicing professionals
Student Roles	Explorer Cognitive Apprentice Teacher Producer	Students have opportunities to explore new ideas/tools; push the envelope in ideas and research Learning is situated in relationship with mentor who coaches students to develop ideas and skills that simulate the role of practicing professionals (i.e., engage in real research) Students encouraged to teach others in formal and informal contexts Students develop products of real use to themselves and others

SUMMARY

- The word research has been used in many different ways and sometimes rather loosely giving rise to confusion and sometimes with the intention to deceive.
- There are six ways in acquiring knowledge and they are; through our beliefs, intuition, authority, empiricism, rationalism and science.

- Research is defined as the systematic, controlled, empirical and critical investigation of natural phenomena guided by theory and hypotheses about the presumed relations among the phenomena.
- The purpose of the scientific method is to describe, explain, control and predict phenomena.
- Educational research is defined as research that investigates the behaviour of students, teachers, administrators, parents and so forth.
- The seven steps of the educational research process is a useful guide for beginning researchers to follow.
- A good research problem is stated clearly, expresses a relationship between variables and can be tested empirically.
- An independent variable can be manipulated to see its effect on a dependent variable.
- Operational definition of variables is necessary to allow measurement and elimination of confusion.

KEY TERMS

Research

Variables

- continuous variable
- categorical variable
- independent variable
- dependent variable

Scientific Method

Operational Definition

Educational Research

The Research Process

- Research question
- Hypothesis
- Research questions



DISCUSSION QUESTIONS:

1. Write down your definition of research.
2. Suggest how you will go about finding a research problem that you propose to investigate.
3. Discuss some educational research you have read?
4. *[Go to OUM's Digital Library and click on 'ProQuest' which has a good collection of journals in education]*
5. List the current thinking on research in your area of interest.
6. Make up operational definition for the following variables:
 - Underachievement
 - Parental bonding
 - Aspirations [of teenagers]
 - Autocratic Leader [principal or headmaster]
 - Teacher Burnout
 - Socioeconomic status
 - Leadership
 - Reading ability
 - Delinquency
 - Interests



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