PREFACE

In a bid to standardize higher education in the country, the University Grants Commission (UGC) has introduced Choice Based Credit System (CBCS) based on five types of courses viz. *core, generic elective, discipline Specific, ability and skill enhancement* for graduate students of all programmes at Honours level. This brings in the semester pattern, which finds efficacy in sync with credit system, credit transfer, comprehensive continuous assessments and a graded pattern of evaluation. The objective is to offer learners ample flexibility to choose from a wide gamut of courses, as also to provide them lateral mobility between various educational institutions in the country where they can carry their acquired credits. I am happy to note that the university has been recently accredited by National Assesment and Accreditation Council of India (NAAC) with grade ''A''.

UGC (Open and Distance Learning Programmes and Online Programmes) Regulations, 2020 have mandated compliance with CBCS for U.G. programmes for all the HEIs in this mode. Welcoming this paradigm shift in higher education, Netaji Subhas Open University (NSOU) has resolved to adopt CBCS from the academic session 2021-22 at the Under Graduate Degree Programme level. The present syllabus, framed in the spirit of syllabi recommended by UGC, lays due stress on all aspects envisaged in the curricular framework of the apex body on higher education. It will be imparted to learners over the six semesters of the Programme.

Self Learning Materials (SLMs) are the mainstay of Student Support Services (SSS) of an Open University. From a logistic point of view, NSOU has embarked upon CBCS presently with SLMs in English/Bengali. Eventually, the English version SLMs will be translated into Bengali too, for the benefit of learners. As always, all of our teaching faculties contributed in this process. In addition to this we have also requisitioned the services of best academics in each domain in preparation of the new SLMs. I am sure they will be of commendable academic support. We look forward to proactive feedback from all stakeholders who will participate in the teaching-learning based on these study materials. It has been a very challenging task well executed, and I congratulate all concerned in the preparation of these SLMs.

I wish the venture a grand success.

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Vice-Chancellor

Netaji Subhas Open University

Under Graduate Degree Programme
Choice Based Credit System (CBCS)
Subject : Honours in Education (HED)

Course : Pedagogical Studies

Course Code : CC ED 06

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Module – I
PEDAGOGY & TEACHING

Module – II
PEDAGOGY & PRACTICES

MODULE – 1

Unit–1 : Pedagogy

Structure

1.1 Objectives

In this Unit, we have tried to introduce you to the basic concepts of Pedagogy- a course for distance education. After familiarizing you with basic concepts we lead to the art of science of teaching with exemplifications. Pedagogy of teaching learning is further discussed as a scientific procedure. After the end of this unit, you should be able to

- Explain Pedagogical studies as academic discipline
- Comprehend concept and nature of Pedagogy
- Explain scope of application of Pedagogy in authentic context
- Explain the philosophical bases of Pedagogy
- Justify why sociological foundation is necessary for designing Pedagogy
- Explain psychology is always create the basic framework of Pedagogy
- Differentiate Pedagogy Vs Andragogy

1.2 Introduction

The term course includes more than a subject matter and content for appropriate level of the conventional mode. It is used to describe the teaching materials and other components of study. A course outline shows how these components of course are used with allotment of specific time. It also indicates how the sequence of teaching is maintained from a numbered unit of course titles. In distance education we have to consider methods to be used alongside the subject to be taught. We present you here with a number of ideas to understand the concept & issues of pedagogy and how it is different from andragogy.

1.3 Pedagogy : Concept Nature and Scope

1.3.1. Concept of Pedagogy

'The most important school-related factor in student learning is teaching' (Schwartz, 2009). There is a viable consensus among academicians at global scale that the performance of any education system is exclusively dependent on the quality of teaching. 'The quality of an education system cannot exceed the quality of its teachers' (Barber &Mourshed, 2007). Any institution that has the best teachers is always best in ranking. Recent UK research concluded that 'having a very effective, rather than an average teacher raises each pupil's attainment by a third of grade' (Machin & Murphy, 2011). It is time to focus on what constitutes effective teaching, or, put differently, on the behaviours and actions of good teachers: what it is that good teachers do to promote good learning.

In this context the term Pedagogy is relevant and it is needed to understand pedagogy in the light of students' learning. But single out any pedagogical approach in the 21st century is not logical in any way. Therefore, we need to focus on pedagogies instead of pedagogy. Let's discuss the concept of pedagogy. Pedagogy is dealing with ideation and techniques of teaching. The main concern of pedagogy lies in setting up an environment where the needs and dreams of a student are being understood by the teacher. And the teacher is also trained in such a manner that he/she delivers the best attitude towards students. The broader sense is the transfer of knowledge on a global rate and the micro details cover the basic etiquette development.

Johann Herbert was the first one to establish the relationship between pedagogy and its effect on society. Education was the basic step for transformations and pedagogy was learning the techniques to imply it. He emphasized how five key factors of this concept viz. preparation, presentation, association, generalization, and application can

turn a normal citizen into the most productive asset for the economy and society. The main focus was to keep a goal and by practicing it in society one can achieve it too.

Pedagogy is the way the curriculum is transacted. Therefore, pedagogy encompasses how teachers think and how teachers act, that is teacher thinking and teacher doing, the one impacting on the other, and with the third dimension of the visible, observable and measurable impact of the teachers' pedagogy on the learners. Therefore, these three aspects of teacher thinking, doing and their impact on student learning outcomes make up 'effective pedagogy', as illustrated in the following conceptual framework model which reflects the relationship of curriculum and its assessment modes and teacher education to teachers' thinking and doing within a specific context are part of this conceptual framework, and can be conceptualized as enabling or disabling teachers' thinking and doing (Westbrook J et. al., 2013.).

In other words, pedagogy refers to that set of instructional techniques and strategies which enable learning to take place and provide opportunities for the acquisition of knowledge, skills, attitudes and dispositions within a particular social and material context'. More clearly speaking, Pedagogy (or teaching) is the interactive process that takes place between the educator and the child to enable learning to take place. Pedagogy is distinct from and complementary to the curriculum. In alternative words, we can say that curriculum describes the 'what', that is, the learning opportunities on offer while pedagogy describes the 'how', that is, how the educator can assist the child to learn. The pedagogical interactions between the educator and the child will be greatly influenced by the early childhood curriculum model in place within the early childhood service.

Let's have a discussion to further illustrate the concept of pedagogy for a comprehensive idea about pedagogy. Pedagogical practice, may be interpreted through three main approaches:

Structured Approach : This approach describes a highly adult directed curriculum and largely didactic pedagogical techniques, providing for little initiative on behalf of the child. The rationale for this method is based on development theory where children are expected to learn skills and concepts in sequence. This approach sees curriculum objectives very clearly defined and the educator in control of the child's learning.

Open Framework Approach : This approach provides the educator with a broad framework for learning, the ability to use endless pedagogical techniques and strategies. As curriculum classification within this approach is less structured, the child has the freedom and flexibility to make choices between the various learning opportunities on offer. As learning opportunities provided span across all areas of learning and development, a balanced range of experiences is encouraged over a period of time.

This enables a process of 'active learning' where the child constructs his own understandings within a social and physical environment.

Child-led Approach : A Child-led Approach is where the educator responds entirely to the child's interests and activities. Topic or project themes are adopted based on the child's interests. The main curriculum emphasis is based on developing the child's independence, social and emotional growth, creativity and self-expression. The learning environment is designed to open-ended exploration and discovery.

At this juncture of understanding, it can be useful to explore the following few issues relating to our current understandings of pedagogy. From the outset it is important not to confuse pedagogy with either curriculum or simply 'teaching'; pedagogy informs both. In the context of early year's education where learning through exploration, creativity and play is key, any construct of pedagogy must be broadly based and seen as an evolving process. We need an understanding that fits with the new vision for the contemporary world, which sees children as central to everything that affects them as citizens and as people with rights and responsibilities.

We need an understanding of the questions 'what?', 'how?', 'why?', 'where?' and 'when?' can be asked in relation to learning and teaching, in order that whatever decisions we make as educators, we have something that guides our actions in the many different situations in which we work. Taking all of this into account, could the following represent our current understanding of pedagogy? It is useful to consider the elements at the heart of the pedagogical decisions that we make. We need to consider what we mean when we talk about learning, teaching and development, to be enquiring about the role of interactions and environment as integral features supporting learning, teaching and development, and to be aware of the values and principles that underpin all that we do.

Therefore, pedagogy is about learning, teaching and development, influenced by the cultural, social and political values and principles we have for children in global perspectives, and underpinned by a strong theoretical and practical base.

Types of Pedagogy :

Social Pedagogy : Social pedagogy suggests that education is critical to a student's social development and wellbeing, and thus must be understood broadly as a way to support a person's growth throughout his/her entire life. Thus, social and educational questions must be considered as one, since students are, by nature, social beings. But they require education in order to communicate effectively as such. The way social pedagogy is approached can vary in different countries, and based on different social and cultural traditions. In Germany, for example, educators typically view social

pedagogy in the same vein as social work. In Norway, the emphasis is on working with children and young people.

An example of how social pedagogy could be used includes emphasizing the importance of things like compassion and being kind-hearted, and using dialogue to communicate lessons; studying concepts in the context of modern lifestyles; or looking at common issues within society that relate to our desires and needs to be social beings, such as social exclusion, its causes and consequences.

Critical Pedagogy : Critical pedagogy is a reflection of Frankfort school's ideas and principles in education. Critical theory was initially started in Europe and then was developed by theorists such as Habermas, Horkheimer, Adorno, and Gramsci. To engage in critical pedagogy is to break down and deconstruct typical world views about topics and learning. It often involves more critical theories, and even radical philosophies. The goal is to continuously challenge students to question their own thoughts and ideas, beliefs, and practices, to think critically and gain a deeper understanding. Forget the dominant beliefs and paradigms - try and figure out things on your own, and in your own way.

Educators can adopt critical pedagogies by asking students to look for deep meaning and root causes of everything from religion to war and politics; or to explore and analyze relationships and issues of power within their own families. They might also look for underlying messages or biases in popular culture and mass media.

Culturally Responsive Pedagogy : In a culturally diverse society, three functional dimensions - institutional, personal, and instructional - are used together to recognize and respond to cultural differences among various students, and celebrate different approaches and methods of learning. To adopt such a style, an educator must be willing to accept the different needs of a multicultural classroom, and create an equally comfortable and enriching learning environment for all students.

This pedagogical method often relies on a student centered approach to teaching, whereby educators identify different cultural strengths of students, and nurture those to ensure that students have a positive sense of self, and can achieve their goals.To apply culturally responsive pedagogy requires teachers to adapt their practices to accommodate the different cultural needs of students. It can also mean that an institution has to reform its school policies and procedures to encourage more community involvement.

A culturally responsive approach should respect and encourage the sharing of different ethnicities, races, and beliefs, and be aware of the backgrounds of students. In a culinary course, that could mean including knowledge of cultural dishes in course work. In a political course, it might involve debates and analyses of different political

topics, approaching them from different cultural angles. In law, it could be respecting various religious beliefs, or cultural differences in how families might view the same legal issues.

Socratic Pedagogy : Following a more philosophical approach, Socratic pedagogy involves a process whereby students can develop their social and intellectual skills in order to live more actively as part of a democratic society so it leads to active citizenship education. Students are encouraged to challenge traditional assumptions about knowledge, look for alternatives, and create knowledge through their own thoughts and experiences, as well as via meaningful dialogue with others. Thus, curriculum will often involve collaborative and inquiry-based teaching and thinking as students test established ideas against others to open their minds and gain a deeper understanding of concepts.

An example is the community of inquiry by C.S. Peirce and John Dewey, which, instead of basing knowledge on fixed scientific facts, looks for social context to learn more about a topic. Another is Bohm Dialogue, which involves group conversations where participation happens without judgment in order to come to an understanding on a topic. Students in a science or math course, for example, might look beyond the hard facts to determine why and how a particular scientific or mathematical principle is what it is, and what that means for society.

1.3.2 Nature of Pedagogy :

From the above discussion it is understandable that pedagogy is an encompassing term concerned with what a teacher does to influence learning in others. As the importance of high quality education for children has become more clearly understood, so has the educator's role in the provision of these services. This demands a clear understanding of the meaning of 'pedagogy' and how it plays out in individual educators and services. Most of the interpretations show a range of thinking around the term pedagogy, all of which have what a teacher does and how they do it at their core.

The function or work of teaching is to adapt the art or science of teaching and accordingly design education instructional methods. The instructional techniques and strategies that allow learning to take place. It refers to the interactive process between teacher/practitioner and learner and it is also applied to include the provision of some aspects of the learning environment (including the concrete learning environment, and the actions of the family and community) (Siraj-Blatchford, Sylva, Muttock, Gilden& Bell, 2002).

Quality teaching is defined as pedagogical practices that facilitate for diverse children their access to knowledge, activities and opportunities to advance their skills

in ways that build on previous learning, assist in learning how to learn and provide a strong foundation for further learning in relation to the goals of the early childhood curriculum and cultural, community and family values. (Farquhar, 2003)

Over the time a new term was being introduced known as "critical pedagogy". Many observed that the conservative technique does not guarantee overall development; instead it gave empowerment to some students over others. This created a social imbalance which needed to be cleared out. Thus it is in which a student association is made and their complaints are heard. And if their complaints are found logical, necessary changes are made in the institution. The authority is given to teachers and students and altogether they work in a direction to provide a better platform for students for learning.

Chris Husbands and Jo Pearce (2012) in their article, 'What makes great pedagogy? Nine claims from research', had explicitly tried to interpret the nature of pedagogy. To justify that pedagogy is instrumental in learning, they used the term 'Effective Pedagogy'. We can list up their advocacy about the nature of pedagogy as follows:

1. Pedagogies give serious consideration to pupil voice.

2. Pedagogies depend on behaviour (what teachers do), knowledge and understanding (what teachers know) and beliefs (why teachers act as they do).

3. Pedagogies involve clear thinking about longer term learning outcomes as well as short-term goals.

4. Pedagogies build on pupils' prior learning and experience.

5. Pedagogies involve scaffolding pupil learning.

6. Pedagogies involve a range of techniques, including whole-class and structured group work, guided learning and individual activity.

7. Pedagogies focus on developing higher order thinking and metacognition, and make good use of dialogue and questioning in order to do so.

8. Pedagogies embed assessment for learning.

9. Pedagogies are inclusive and take the diverse needs of a range of learners, as well as matters of student equity, into account.

The finding of ongoing research suggests that outstanding pedagogy is far from straightforward. Classrooms are complex, multi-faceted and demanding places in which to work and successful pedagogies are correspondingly sophisticated. Highly successful pedagogies develop when teachers make outstanding use of their understanding of the research and knowledge-base for teaching in order to support high-quality planning and practice. The very best teaching arises when this research base is supplemented by a personal passion for what is to be taught and for the

aspirations of learners. There is a robust evidence base which helps to identify the ingredients of outstanding pedagogic practices. However, truly effective practices depend on teachers making active connections between the ideas from research. The most effective successful classroom practices work these ideas together in systematic and sophisticated ways, and the best teachers are active in building relationships between them. Understanding the ways in which these relationships are built - what Leahy et al. (2005) have called 'minute-by-minute classroom practices' - is itself a fruitful area for both further research and improving practice.

1.3.3 Scope of Pedagogy :

The discussion about the concept and the very nature of pedagogy has already given substantial hints about the broader scope of the application of pedagogy or how meaningful the study and research of pedagogy is. Some theoreticians considered pedagogy as educators' professional practice, especially those aspects that involve nurturing relationships, curriculum decision-making, teaching and learning. (Deewr, 2009). Pedagogy develops from a range of factors including theories and research evidence, political drivers, evidence from practice, individual and group reflection, educators' experiences and expertise, and community expectations and requirements. It informs both curriculum (all the interactions, experiences, activities, routines and events planned and unplanned) and teaching in a service. It reflects and supports the principles of and outcomes sought by a teaching profession.

Pedagogy is an extremely complex phenomenon comprising a wide variety of practices underpinned by principles acquired through training and as a result of professional experiences and personal understandings. Because of its complexity 'effectiveness' has to be viewed as a whole rather than as particular aspects taken in isolation. (Moyles, Adams & Musgrove, 2002).

Today's classrooms are structured by multiple layers of complexity. Critical pedagogy explores the relationship between power and knowledge, a complex relationship that stems from extreme forms of heterogeneity characterizing today's educational and social settings. This understanding compels a pedagogue to interrogate issues of privilege, notions of neutrality and objectivity, and the notion that politics should be kept out of education. By focusing on the margins of society, this pedagogy seeks to throw light on communities, voices, texts, and perspectives that have been traditionally excluded. By providing a safe space for marginalized bodies to come to voice, it challenges the Euro centric, patriarchal, and elitist ways of seeing, teaching-learning.

Having a well thought-out pedagogy can improve the quality of teaching and the way students learn, helping them gain a deeper grasp of fundamental material. Being

mindful of the way your teacher can help you better understand how to help students achieve deeper learning. And it can, in turn, impact student perception, resulting in cooperative learning environments. The proper approach helps students move beyond simple forms of thinking as defined in the Bloom's taxonomy pyramid, like basic memorization and comprehension, to complex learning processes like analysis, evaluation, and creation. Students can leverage their preferred learning styles with a teaching process that supports them, and the way they like to learn.

The scope of Pedagogy is wide and instrumental and is ever-growing due to constantresearch in this field. The following areas may indicate the scope of Pedagogical study :

A. Understanding Child :

To support the vision of every child as an 'active agent' in society, we need to be aware of the experiences that children have in their early years that help them to develop as confident, powerful, competent individuals. We know that children are born with powerful motivations to learn and that in order to learn effectively, they need people to interact with. How can we be sure that we are engaging with young children appropriately and, most importantly, engaging in meaningful ways?

Pedagogy helps us to understand that children need active support from adults who:

- are well informed about child development
- are respectful of and interested in children
- are knowledgeable about and value the importance of play and the powerful contribution it makes to children's development and learning
- understand the importance of relationships with other children and with adults
- recognize learning contexts that are real and meaningful to the child.

B. Instructional strategy of teaching learning for outcomes-based learning :

Research on teaching, learning and outcomes shows that quality pedagogy is identified as a key lever for improving children's outcomes. Sound research evidence, discussed later, shows what educators can do to provide children with strong foundations for ongoing learning and development in all aspects of life. This evidence must be reflected in educators' pedagogy if children's learning and development is to be optimized.

C. Inclusive Learning and Development Services:

The importance of a shared understanding of high-quality pedagogy in its early childhood education and care services in ensuring it meets the mission statement of

the organization and that the values of the organization are embedded in everyday practice. This statement aims to ensure that Child the professionals we collaborate with, the communities we operate in and the broader community are aware of the pedagogy enacted within our services.

D. Deeper understanding of what is informing our practice :

It will provide the educators within our services with an understanding of the evidence base behind this pedagogy and an awareness of how they can contribute to the development of pedagogy. The statement will assist in ensuring educators are aware of the impact they have on children and to articulate not only what they do, but why and how they do what they do to parents, careers and the wider community.

E. Policy context that focuses on quality and continuous improvement of teaching-learning :

In continuation of the previous policy the NEP-2020 has emphasized on expected national standards of teacher professionalism. So, the process of building a National Quality Framework is essential. Such a framework includes state legislation underpinning a National Quality Standard. Such a standard requires services to enhance each child's learning and development through the development of curriculum informed by an approved learning framework. Child Inclusive Learning and Development services subscribe to the principles, practice and outcomes of child learning. The approach of these frameworks supports the mission to develop the capacity of the early childhood education and care sector, families and community to support children's wellbeing, learning and development and reflects our values of integrity, respect, recognition, collaboration, commitment and innovation.

F. Spirit of enquiry and professional dialogue for teacher

Pedagogy creates interest about why we do what we do, that learning through play and intentional teaching are key to optimizing children's learning and development and that children are people with agency. Effective pedagogy not only produces outcome results in relation to input, but also represents a common core of values and objectives to which all those involved can subscribe. (Moyles, Adams & Musgrove, 2002)

Further to the above areas, the more specific scopes of pedagogical studies though not limited, but may be instrumental in following areas :

1. **Designing Learning :**
   a. **Structuring learning :** Pedagogy provides a model for the process of designing learning. It starts by considering factors affecting learning design,

including the influence of the type of learning objective on the choice of approach. It goes on to explore effective methods of sharing learning objectives with pupils. There is guidance on how to structure learning by splitting the learning unit into a series of episodes, and on choosing from a range of strategies and techniques to motivate pupils. Finally, there is an examination of three pedagogic approaches - direct interactive, inductive and exploratory - to show how they can help pupils develop tools for learning, such as inductive thinking or enquiry skills.

b. Teaching models : Pedagogical study helps to determine principles and practice of teaching. It explores a range of teaching models and encourages teachers to review their teaching practice against the models described. For each teaching model pedagogy helps to select the model that might be applied in classrooms.

c. Lesson design for inclusion : The principles for ensuring the inclusion of all pupils in lessons, and how to hold them all into the learning process is a major challenge that can be addressed by pedagogical understanding. It provides a first insight into the needs of many groups that need to be included, such as lower attainers, gifted and talented and CWSN etc. pupils.

2. Teaching Repertoire :

a. Modeling Teaching : Modeling is a powerful strategy that can be used across all subjects to help pupils to learn and to develop confidence in a new skill or procedure. This unit sets out the principles of this strategy and provides guidance on how to introduce modeling into lessons and make it effective.

b. Art of Questioning : Different types and purposes of questioning are guided by pedagogy. It explains how to organize questioning for whole-class and group work, and offers strategies such as providing 'wait time' for making it effective.

c. Explaining Concept : The purpose of explanations in teaching and the characteristics, features and skills of successful explanations is a major focus of pedagogical studies. It explores different types of explanation, how to plan for them, which strategies are effective - particularly for those involving abstract ideas. It also provides guidance on how to support pupils in planning and articulating their own successful explanations.

d. Guided Learning : What kind ofprinciples and approaches involved in guided reading and writing can be used to support guided learning in subjects across the curriculum which is determined by pedagogical understanding.

The instructional sequence for the teacher working with small groups, which is integrated into lessons to act as a bridge between whole-class teaching and independent work.

e. **Group work in Teaching Learning :** Pedagogy determined Effective group work can help to improve pupils' speaking, listening, thinking, and problem-solving and social skills. It emphasizes the need for establishing clear rules and procedures and sets out a range of techniques to ensure pupil engagement and cooperation, such as allocating roles and setting group targets.

f. **Ensuring Active engagement :** Pedagogy helps teachers to understand what is meant by engagement and why it is important. A range of strategies to motivate and engage pupils is examined, for example directed activities related to text to promote active reading, strategies to promote active listening, thinking strategies etc.

3. Creating Effective Learners :

a. **Assessment for learning :** Pedagogy creates scope to understand what is meant by assessment for learning and its importance. It explains how good assessment practice can contribute to better learning and higher achievement.

b. **Developing reading and writing :** Improving pupils' ability to understand and to respond to subject-specific written texts is the task of the teacher. Pedagogy may empower the teacher to support pupils by clarifying the approach they need and how the teacher can use shared and guided reading to enable pupils to develop more independence and skill as readers. Similarly teachers with their pedagogical knowledge only can improve the quality of pupils' writing through actively. Teacher can guide the student on what, how and why they have to write.

c. **ICT integration in learning :** The use of ICT in classrooms enhances learning and teaching. The T-PCK or Teacher's Techno Pedagogical Content Knowledge is key elements of integration of ICT in enhancing learning. So overall pedagogical knowledge helps to understand the kind of blending of ICT is needed in teaching specific subjects.

d. **Leading in learning :** The aim of 21st century learning is enhancing learner's critical thinking skills. This could be done by clarifying the nature of higher-order thinking and different approaches to 'teaching' thinking. It also provides practical guidance for improving the teaching of aspects of thinking skills lessons, such as improving the teaching of the plenary, helping pupils to see the relevance of thinking in everyday contexts and developing their use of

'thinking words'. The entire task is determined by the pedagogical understanding of the teacher.

4. **Creating conditions for learning :**

   a. **Improving the climate for learning :** The physical environment can make a significant difference to learning, and therefore, pedagogy helps us to explore how even small changes to the classroom can help. The sound pedagogy only can determine the starting from physical arrangements to teacher-student relationships are another important factor in classroom climate to motivate students to learn.

   b. **Identifying Learning styles :** Pedagogy provides a basis on how to identify different learning styles and more importantly helps teachers to understand the need to provide a variety of activities to suit different styles, over time. There is guidance on how to plan and adapt activities to accommodate visual, auditory and kinesthetic learners.

   c. **Classroom management :** Classroom management is a key factor in teaching learning. Appropriate pedagogy helps us to understand the concept of teaching behavior that is conducive to learning. Pedagogy guides teachers to interpret pupil's response to structures and routines, and guides them as the teacher's verbal and non-verbal language is pivotal in securing and maintaining relationships for learning.

1.4 Bases of Pedagogy–Philosophical, Sociological and Psychological

Any interpretation of pedagogy is intimately bound up with definitions of learning, orientation and application in classroom contexts. An emphasis on learning as an individual process of social interaction, and imitation of an expert other is clearly upheld within developmental and psychological domains that have a stronghold in contemporary formative year's scholarship and practice of the learners. For example, Vygotsky's Marxist orientation (philosophy) positions learning as a dialectical process that leads the learner into higher psychological thinking and sets the scene for intervention as advancing knowledge: a process that Fleer (2010) describes as 'pedagogical framing'. As the child learns in a socio-cultural context, therefore the sociological belief system impacts pedagogical practices in a given social context. From this viewpoint, the developing child is led into a more sophisticated way of thinking in the world. Therefore, philosophical, sociological and psychological bases hold importance in influencing pedagogical understanding and practices.

1.4.1 Philosophical Bases of Pedagogy

The philosophical foundation of pedagogy helps to determine the driving purpose of education, as well as the roles of the various participants. While all foundations propose to set goals of education in general, philosophy presents the manner of thinking from which those goals are created. One's driving philosophy suggests if pedagogy should develop the individual or enforce group norms; if it is to enforce group norms, it further defines if that should be the norms of the current set or a move towards changing those norms. Philosophies vary in perception of truth, ranging from absolute to relative, and from moralistic to scientific. In all of this, one's philosophy defines the role of the teacher, ranging from all-knowing authoritarian to that of a mentor, and the role of the student, ranging from an obedient vacant vessel to an individual worthy of actively engaging in one's own educational process. As we look through the lens of history, we see how philosophies have gained and waned in popularity in society, and how even psychological research is embraced, ignored, or even rejected based on philosophical standings of the time.

On the basis of research by Farquhar & White (2014), we can say that the literature shows that philosophical ideas constantly expands and shifts in approaches to teaching and learning for last few decades. Philosophical thoughts locate pedagogy across private and public space; in and outside of traditional forms of constructivism beyond instrumental imperatives and beyond dominant paradigms. Pedagogy might be viewed as more relational: democratically oriented towards what is held in common and, from a dialogical standpoint, what is not. Emphasis is also given to perception, disaffection, dialogue and wonder and 'unconsciousness' as a pedagogical state for learners and teachers alike.

The subjective and intersubjective nature of pedagogy is keenly felt in philosophy and practice for pre-adolescent and adolescent learners. All children are not necessarily identical and typical in their thinking and developmental pattern, hence pedagogy should encompass those who do not necessarily share the same replicative approaches and therefore requires a sophisticated engagement within the wider world beyond the immediate contexts that determine its value.

In this era of pedagogical certainty and on the cusp of standards-based agendas, such philosophical inquiry is a welcome to the pedagogical alternative for pre-adolescent and adolescent education.

In contrast to romanticism, the new philosophy invites new ways of conceptualizing pedagogy. James Stillwaggon, expanding on this dilemma and highlighting the divided nature of pedagogy in romantic and modern visions of the ideal childhood. Here, a central pedagogical conflict between rationalism and sentimentality is unleashed.

Certain premises of philosophy approves pedagogy of intervention, such pedagogy carefully establishes as a prevalent emphasis on pedagogical duty where learning 'problems' are identified and addressed accordingly. In such a view, pedagogies consist of certainty, based on 'experts' who know what is needed, claim legitimacy. While some educationists consider early intervention as an issue of inequality-one where the child is placed within deficit paradigms, exacerbated by the knowledgeable interrogation of the expert who seeks solutions to the 'problem' that they themselves have identified. In this position, the teacher must drive the learner's will; in the case of early intervention this means both child and parent who must be shown the error of their ways in order to escape their deficiencies. A pedagogical orientation offered by Jayne White also calls for teachers to trust in the agency of the child and their innate potential and, as a consequence, to attend to the ethical implications of seeing in pedagogical encounters.

This timely addition to the issue directs pedagogical attention to the cultural significance of the learner, challenging strongholds of certainty across time and space. Therefore, for developing any relevant pedagogical framework it is needed to consider the relevant contemporary philosophical thoughts.

1.4.2 Sociological Bases of Pedagogy

Society is a reflection of the governing philosophies of the masses, requiring that studying the sociological foundation of pedagogy to include consideration of philosophical foundations. Society is dynamic, with the changing popularity of a particular philosophy mirroring factors such as environmental and economic needs: war or peace time, recession or time of abundance, changing technology, and so on. For example, if a nation is at war, greater emphasis will be placed on sacrificing for the greater good, moralistic principles, and adhering to group norms. During such times, however, there will be dissension based on counter philosophical ideas; the strength of one's philosophical convictions will determine one's perception of the current events, including those impacting education.

The man is born in society and has to develop his personality in the society According to Ross ``Individuality is of one value and personality is meaningless apart from social environment. In the social environment an individual interacts with forces which influence him and he also influences the society. An individual can learn very little by himself. In his learning society contribute very significantly. Man lives in the society, acquires socialization through his contact with family, his relatives, friends. He learns basic things with mutual behaviour through this contact. If an individual is left alone without any companions and society then his learning will not take place, therefore for education the presence of other people, means society is very necessary. Education and society are interdependent and complementary to each other. No

educational system can be understood without looking at the canvas of society. Society can never progress without the sound system of education. Education should enable the pupil to be a useful member of society.

Therefore, pedagogical understanding and practices are intrinsically related and evolving from sociological ideas. Such interaction of teaching learning and sociology is well documented in the body of educational research. Thus, educational sociology is meant for finding out ways and means to manipulate the educational process to ensure learning which is socially relevant and appropriate.

All societies have their own ways and means of meeting this need. Education as a process has come to stay as an effective means of meeting this need. Education does not only transmit the past cultural heritage; it is meant to help in the reconstruction of our modes of living. It may help in developing new social patterns in the areas of health, leisure, vocation and family life. Reconstruction and adaptation are necessary but of scientific developments, industrialization and technological advancements, which are disturbing the urban as well as rural pattern of living. Therefore, sociological thoughts help us to understand the constant and dynamic interaction of the individual and his/her cultural environment, it enables us to understand the child from the point of view of social milieu. Sociology influences pedagogy to evolve to prepare educators for their future tasks. It uses the results of sociological research in developing teaching learning activities.

Education preserves the social and cultural heritage which is owned by sociology. Society is the prime factor in determining the educational patterns so that its sociocultural needs may be satisfied and continue to grow. Emile Durkhiem who first clearly indicated the need for a sociological approach to the study of education. He considered that education to be something essentially social in character in its origins and its functions and that as a result the theory of education relates more clearly to sociology than any other science.

As the teacher is himself/herself a member of the social community therefore, they should be committed to society. He/she should know the main institution and powers that mainly influence a student. He should know the instruments of social development, available in an extramural environment. He should have the capacity to use this knowledge in school Education. A teacher should know about the process of socialization among students, the method of interaction and programs for social development.

As Sociological ideas/thoughts largely impact the kind of pedagogy we should design and practice in the school system. Social thoughts advocate majorly the use of project method, socialized techniques, Group discussion and techniques of group

dynamics. Sociological foundations also encourage cooperative learning, problem solving and democratic methods of teaching learning in practicing pedagogy. Those educational methods are good which gives knowledge to the individual, which will enable the students to adapt and adjust to different social situations. Sociology gives importance to group methods of teaching. Methods which are able to develop democratic attitudes among children should be a good method of teaching. According to sociological point of view following are major area of implications on pedagogical discourse:

a. The method of instruction is effective only when the skill and knowledge acquired in the classroom are actually used by the individual in the adjustment to social situations. An individual should be able to achieve social correlation by use of knowledge and skill received in the school.
b. The method of teaching should stress on the social behaviuor outside the class while teaching.
c. The method of teaching should make use of all possible social resources and social operative force in the social life in order to develop the capacity in every individual for social adjustment.
d. The social power currents in the society should be used in the teaching system for increasing the social co-relationship.
e. Sociologists suggest that teaching should be done through cultural and social programs.
f. In teaching, teachers will develop problem solving and constructive thinking. For this socialized techniques, project and group methods fulfill most of the conditions.
g. Students react better to co-operative learning in which there is sharing in the teaching learning process.co-operative group patterns of learning lay emphasis on group interaction.

1.4.3 Psychological Bases of Pedagogy

The psychological foundation of pedagogical practices has continued to expand, especially with exponential growth in neuroscience research. The 1990s had been titled the Decade of the Brain, and great strides have been made in the psychology of learning. One might argue that it is the psychological foundations of approach and method of teaching learning which hold the greatest importance because it is here that we understand how students learn; how to increase student motivation and satisfaction; how to achieve outcome-based learning. However, current pedagogical practices in many schools' systems may not yet fully embrace the current research due to the prevailing rigid philosophies held by authorities in power. To gain acceptance of

research-based educational practices, we must not just show the success of those practices, but also work toward changing the prevailing philosophies that influence the attitudes of society. Also, reaching back to the historical foundation of pedagogical discourse, we should caution ourselves that current research is just that: current. Future psychological research may yield new information. By adopting a guiding philosophy, one does not become fixed and single out to a particular psychological foundation of thought, which history reminds us is ever-changing, and one can instead remain fluid in how one's philosophically-based goals are met.

The different psychological foundations which are potentially impacting pedagogical practices could be broken down into four categories: behaviourism, constructivism, social constructivism, and liberationism.

A. Behaviourism :

A behaviourist pedagogy uses the theory of behaviourism to inform its approach towards pedagogical practices. The most important school of thought of educational psychology in the first half of the 20th century was behaviourism. Behaviorismis a perspective on learning that focuses on changes in individuals' observable behaviors-changes in what people say or do. At some point we all use this perspective, whether we call it "behaviorism" or something else. It described learning as the acquisition, strengthening and application of stimulus-response connections through reinforcement. Teaching was thought to influence this through providing adequate reinforcement. According to behaviourist views, positive rewards following a correct response automatically strengthen the connection to the stimulus. Even complex behavior can be taught by reinforcing spontaneous behaviours step by step, until the whole behavior sequence is built together. Exercise and repetition are seen as crucial to develop and maintain stimulus-response connections.

Behavior is learned and can be unlearned; unacceptable behaviour can be replaced by acceptable behaviour and changes in children's behaviour occur due to the responses they get to their behaviour. Pedagogical practices associated with this theory include: educators reinforce appropriate behaviour through rewards ranging from a positive statement to tangible rewards such as star charts; educators avoid reinforcing inappropriate behaviour or remove children who are behaving inappropriately; educators draw children's attention to the consequences of their behaviour.

Models based on these theories are called "drill and practice" and "programmed instruction". As for example one often relevant to new teachers: when he began my first year of teaching, he was more focused on doing the job of teaching on day-to-day survival than on pausing to reflect on what he was doing. Note that in all of these examples, focusing attention on behavior instead of on "thoughts" may have been

desirable at that moment, but not necessarily desirable indefinitely or all of the time. Even as a beginner, there are times when it is more important to be able to describe how to drive or to cook than to actually do these things. And there definitely are many times when reflecting on and thinking about teaching can improve teaching itself. But neither is focusing on behavior which is not necessarily less desirable than focusing on students' "inner" changes, such as gains in their knowledge or their personal attitudes. If you are teaching, you will need to attend to all forms of learning in students, whether inner or outward.

In classrooms, behaviorism is most useful for identifying relationships between specific actions by a student and the immediate precursors and consequences of the actions. It is less useful for understanding changes in students' thinking; for this purpose, we need a more cognitive(or thinking-oriented) theory, this fact is not really a criticism of behaviorism as a perspective, but just a clarification of its particular strength or source of usefulness, which is to highlight observable relationships among actions, precursors and consequences. Behaviorists use particular terms for these relationships. They also rely primarily on two basic images or models of behavioral learning, called respondent (or "classical") conditioningand operant conditioningas major learning mechanisms.

Some alternative theories advocated in Europe like Gestaltpsychology which can be summarized in the quote, "The whole is greater than the sum of its parts". Accordingly, the Gestalt approach criticized behaviourism for breaking down behaviour into its parts. In the Gestalt perspective, learning is seen as a process of understanding the structures of problems and gaining sudden insight rather than as an iterative development of stimulus-response connections.

B. Constructivism :

Influenced by behaviourism as well as Gestalt and other prevailing schools of thoughts in psychology, the middle of the 20th century saw the rise of cognitive psychologyin both the United States and Europe and later adopted worldwide and thus a shift of focus from behaviour to information processing. Cognitive psychology examines mental processes and knowledge structures. It tries to understand how knowledge of different themes is acquired and structured, and which strategies are used for problem solving. Learning is seen as the acquisition of knowledge.

But while the rise of cognitive psychology led to a deeper understanding of learning processes, it did not yield many innovative approaches for teaching. By and large, cognitive theories still encouraged lectures and the use of textbooks as the preferred instructional methods and assigned students a rather passive role in learning. During the 1970s and 1980s, yet another theory emerged to overcome the limits of cognitive

approaches. Cognitive Constructivism, also termed as biological constructivism suggested a more student-centered approach to instruction. Through interacting with the environment, students were thought to actively build up and reorganize mental structures of knowledge and skills. Numerous instructional approaches are based on constructivism. Central to these is that teachers are not thought to be direct transmitters of knowledge, but rather facilitators of an active, self-directed construction of knowledge. But this school of thoughts also failed to address the significance of the socio-cultural context of learning.

Constructivism is a philosophy of learning founded on the premise that, by reflecting on our experiences, we construct our own understanding of the world we live in. Each of us generates our own "rules" and "mental models," which we use to make sense of our experiences. Learning, therefore, is simply the process of adjusting our mental models to accommodate new experiences. Constructivism as a paradigm or worldview posits that learning is an active, constructive process. The learner is an information constructor. People actively construct or create their own subjective representations of objective reality. New information is linked to prior knowledge, thus mental representations are subjective.

So we can say that constructivism as a learning theory, simply speaking, is to make learning meaningful. The core constructivist perspectives are therefore: (a) learning is a self-directed process-knowledge is constructed rather than directly received; (b) instructor as facilitator; (c) learning as a socio-cultural process (Tobin and Tippins 1993). It has long been argued that a constructivist approach is essential for the development of skills and abilities among the learner.

Originators and important contributors: Vygotsky, Piaget, Dewey, Vico, Rorty, Bruner. There are, however, two major strands of the constructivist perspective. These two strands, cognitive constructivism and social constructivism, are different in emphasis, but they also share many common perspectives about teaching and learning. Before looking at the differences between cognitive and social constructivists, it might be worthwhile to look at what they have in common. Jonassen's (1994) description of the general characteristics of constructivist learning environments is a succinct summary of the constructivist perspective.

Characteristics of Constructivist learning environment :

Jonassen (1994) proposed that there are eight characteristics that differentiate constructivist learning environments:

1. Provide multiple representations of reality.

2. Multiple representations avoid oversimplification and represent the complexity of the real world.

3. Emphasize knowledge construction inserted of knowledge reproduction.

4. Emphasize authentic tasks in a meaningful context rather than abstract instruction out of context.

5. Constructivist learning environments provide learning environments such as real-world settings or case-based learning instead of predetermined sequences of instruction.

6. Encourage thoughtful reflection on experience.

7. Constructivist learning environments "enable context- and content- dependent knowledge construction."

8. Support "collaborative construction of knowledge through social negotiation

C. Social constructivism :

At the end of the 20th century, there was yet another turn in educational psychology. Inspired by the ideas of Vygotsky and culturally comparative research, socio-constructivist theories started examining the interaction of psychological processes within the learner with social and situational characteristics of the learning process. While constructivism described learning as a process happening within the isolated mind of an individual, the socio-constructivist view rather understands knowledge as situated and "being in part a product of the activity, context, and culture in which it is developed and used" (Brown, Collins and Duguid, 1989). Social or Vygotskian constructivism emphasizes education for social transformation and reflects individuals within a sociocultural context. Individual development derives from social interactions within which cultural meanings are shared by the group and eventually internalized by the individual (Richardson, 1997).

The socio-cultural approach emphasizes the relationships and participation are central to learning; children develop and learn in multiple ways that are socially and culturally approved and constructed; children learn ways of being interdependent through their participation in everyday events and as members of different social groups; learning leads development; children are active agents and contributors in the social groups in which they participate. Pedagogical practices associated with this theory include: educators take the context of children's lives into account in their expectations, planned experiences and in routines such as meals and sleep arrangements; children's learning is scaffolded (for example, questions, demonstrations, prompts) by adults or other children; children move through learning with assistance to independent understandings; educators use responsive listening in order to understand and respect children's learning; learning experiences connect with and extend children's ways of knowing, skills and understandings that they bring from home and the community; documentation of children's learning is in multiple forms to make the learning visible to others.

Constructivism states that learning is an active, contextualized process of constructing knowledge rather than acquiring it. Knowledge is constructed based on personal experiences and hypotheses of the environment. Learners continuously test these hypotheses through social negotiation. Each person has a different interpretation and construction of the knowledge process. The learner is not a blank slate (tabula rasa) but brings past experiences and cultural factors to a situation. So, context and authentic experience has been considered as major factors that are supposed to influence the learning. As biological or cognitive constructivism emphasizes the individuality of the learner it was insufficient to accommodate the experiential learning in reference to social context.

Schools are the sociocultural settings where teaching and learning take place and where "cultural tools," such as reading, writing, mathematics, and certain modes of discourse are utilized (Richardson, 1997). This approach assumes that theory and practice do not develop in a vacuum; they are shaped by dominant cultural assumptions (Martin, 1994; O'Loughlin, 1995).

To accomplish the goals of social transformation and reconstruction, the context of education must be deconstructed, and the cultural assumptions, power relationships, and historical influences that undergird it must be exposed, critiqued, and, when necessary, altered (Myers, 1996). Variants of social constructivism include situated constructivism, social re-constructivism, sociocultural constructivism, socio historical constructivism, and emancipatory constructivism.

Several practices have evolved from this approach; for example, "self-directed learning", "co?operative learning", "self-regulated learning", "guided discovery", "scaffolding", "cognitive apprenticeship", "teacher-mediated dialogue", "independent group discussion", "problem based learning", "project-based learning", and "knowledge building". Though Europe was the hotspot of theorization, it expanded and such social constructivism was instrumental in promoting a "learner-centred approach" and an emphasis on "communicating, inquiring, conceptualizing, reasoning and problem-solving" model of learning. It also integrates ideas of adaptive or differentiated instruction, making demands to account for "individual differences and the needs of individual students" and the use of formative assessment.

It is important to note here in NCF-2005, Constructivism has been singled out for learning and 5'E learning model, Interpretation Construction Model are few examples of such constructivist approach.

Guiding principles of constructivism in general may include :

1. Learning is a search for meaning. Therefore, learning must start with the issues around which students are actively trying to construct meaning.

2. Meaning requires understanding wholes as well as parts. And parts must be understood in the context of wholes. Therefore, the learning process focuses on primary concepts, not isolated facts.

3. In order to teach well, we must understand the valuable way to measure learning is to make the assessment part of the learning process, ensuring it provides students with information on the quality of their learning.

Constructivism as whole may impact learning in following ways :

Curriculum : Constructivism calls for the elimination of a standardized curriculum. Instead, it promotes using curricula customized to the students' prior knowledge. Also, it emphasizes hands-on problem solving.

Instruction : Under the theory of constructivism, educators focus on making connections between facts and fostering new understanding in students. Instructors tailor their teaching strategies to student responses and encourage students to analyze, interpret, and predict information. Teachers also rely heavily on open-ended questions and promote extensive dialogue among students.

a. Involves collaboration between instructors, students and others (community members). Tailored to the needs and purposes of individual learners. Features active, challenging, authentic and multidisciplinary learning
b. Constructivism can help students pursue personal interests and purposes. Use and develop his or her abilities. Build on his or her prior knowledge and experiences. Develop life? long learning
c. Constructivism encourages instructors to provide for each student's preferred learning style. Rate of learning Personal interactions with other learners

Assessment : Constructivism calls for the elimination of grades and standardized testing. Instead, assessment becomes part of the learning process so that students play a larger role in judging their own progress.

Constructivist frameworks in teacher education :

While it may inform and influence practice, constructivism is a theory of learning, not a theory of teaching, and translating theory to practice is both difficult and imprecise. However, education literature documents several large- and small-scale efforts to do so.

Constructivist teacher education generally reflects two major traditions–the developmental and social reconstructionist traditions. Programs influenced by the developmental tradition attempt to teach students how to teach in a constructivist, generally Piagetian, manner. They are typically characterized by substantial direct instruction in theory and practice, often without complementary opportunities for

inquiry, discovery, or self-examination. This approach can easily become overly prescriptive. If this occurs, the teacher educator models an approach to teaching that is essentially antithetical to the approach students are intended to employ in their future classrooms.

Programs influenced by social reconstructionist tradition attempt to help teacher education students deconstruct their own prior knowledge and attitudes, comprehend how these understandings evolved, explore the effects they have on actions and behavior, and consider alternate conceptions and premises that may be more serviceable in teaching. Critical analysis and structured reflection on formal course knowledge and everyday practical experience are incorporated.

Richardson identifies two factors that appear to affect the approach teachers and teacher educators take in forming constructivist settings- the extent to which the social is acknowledged as a critical factor in learning and individual cognitive development and the specific content, subject matter, or discipline. Some subjects, such as mathematics, are more "bounded" than others by rules, formulae, and procedures. They are more likely to be regarded by teachers as producing problems and tasks to which there are "correct" answers. Individual interpretations and construction of ideas and concepts are less likely to be encouraged by teachers than in subjects such as literature and writing.

Challenges of adapting constructivist framework :

The challenge constructivism presents to teachers and teacher educators is the formidable task of translating a learning theory into a theory of teaching, which in turn raises questions about what teachers need to know and be able to do. For teacher educators, among other tasks, this involves balancing the need to acknowledge the different discipline-specific requirements of teaching with the need to model constructivist methods in teacher education courses and practicums. Researchers also note the limits of a perspective on teaching that values students' understanding at the expense of "right" answers. Student knowledge becomes idiosyncratic; 30 different students may arrive at 30 different understandings or interpretations of a concept, all of which are not equally appropriate. Inappropriately applied, constructivist approaches may lead to the "abandonment" style of teaching. Several authors cite the importance of teacher educators' modeling constructivist approaches that engage students in interdisciplinary exploration, collaborative activity, and field-based opportunities for experiential learning, reflection, and self-examination. Possible only if future teachers are to be able to employ these strategies in

D. Liberationism :

Methods or practices of teaching that recognize the inherently political nature of

education and aim not, as Paulo Freire puts it in his description of the banking model of education, to produce receptacles of knowledge" to be filled by the teacher, but rather to produce fully self-actualized people. In other words, while dominant education would hold that the role of education is to eradicate any idiosyncrasies an individual is born with and to conform them to an ideal of character determined by the constructs of society, liberatory pedagogy assumes that each individual is born with potentialities that have positive value for that individual and it is good for that individual to develop these potentialities. Pedagogies of liberation, then, hold at their center a celebration of diversity and the infinite variety of types that come about when difference is encouraged to develop. Then, having fostered the inner-development of the individual, liberatory pedagogy moves outward through education-based engagement with oppressions to transform the broader society.

Liberatory pedagogy holds at its center a "counter-politics of knowledge" which affirms that true knowing comes from below, emerges from the context of community struggle, and enables resistance to and transgression of the dominant politics and knowledges which dehumanizes and constructs the millions of people thrown on to the margins by capitalist, colonialist logic as illiterate, unknowing objects. Where dominant pedagogies lift up the 'Europeanized,' individualized thinker as the pinnacle of knowing, pedagogies of liberation hold the experiences of the marginalized as the center of knowing.

In his classic text 'Pedagogy of the Oppressed' (2007), Paulo Freire articulated his vision for an emancipatory education. Vital to this process is his emphasis on dialogue whereby the "teacher-student" facilitates a problem-solving approach to name and act on the "student-teacher's" social reality. Freire also elaborated on the conditions of oppression, although his essentialist categories of "the oppressed" and "the oppressor," and the manner in which these categories ignore the intersections of various oppressions, are problematic. In spite of certain criticism, pedagogy of the oppressed has contributed immensely to understanding oppression and to developing a philosophy and liberatory strategies for people of privilege to work with oppressed people groups.

Bell Hooks in his book 'Teaching to Transgress: Education as the Practice of Freedom' raises concerns about the classroom as potentially liberative site and the academy as a hegemonic industry; she issues challenges to that academy and her fellow teachers and learners; she not only denunciantes what is wrong but also enunciated clearly and celebrates what has worked; she presents elements of her vision of what could be; and she offers particular strategies for creating and working with learning communities.

1.5 Pedagogy Vs Andragogy

Pedagogy :

You already have a comprehensive idea about pedagogy going through the previous subunits. Now in this subunit we would like to discuss andragogy and how it is different from Pedagogy.

Andragogy :

The term andragogycan be supposedly equivalent to the term pedagogy. Andragogyin Greek means the man-leading in comparison to pedagogy, which in Greek means child-leading. However, it should be noticed that the term pedagogy has been used since the Ancient Greek times while Alexander Kapp, a German educator, originally used the term andragogyin 1833.

Principles of Andragogy-

Let's have a look at the principles of Andragogy may be pinpointed after Mezirow (1981)

1. Progressively decrease the learner's dependency on the educator
2. Help the learner understand how to use learning resources-especially the experience of others, including the educator, and how to engage others in reciprocal learning relationship
3. Assist the learners to define his/her learning needs-both in terms of immediate awareness and understanding the cultural and psychological assumptions influencing his/her perception of needs
4. Assist the learners to assume increasing responsibility for defining their learning objectives, planning their own learning programme and evaluating their programme.
5. Organize what is to be learned in relationship to his / her current personal problems, concerns and levels of understanding.
6. Foster learner decision making-select learners relevant learning experiences which require choosing, expand the learner's range of options, facilitate taking the perspectives of others who have alternative ways of understanding.
7. Encourage the use of criteria for judging which are increasingly inclusive and differentiating in awareness, self-reflexive and integrative of experience.
8. Foster a self-corrective reflexive approach to learning-to typifying and labelling, to perspective talking and choosing and to habits of learning and learning relationships.

9. Facilitates problem posing and problem solving, including problems associated with the implementation of individual and collective action, recognition of relationship between personal problems and public issues.
10. Reinforce the self-concept of the learner as a learner and doer by providing for progressive mastery, a supportive climate with feedback to encourage promotional efforts to change and to take risk, avoidance of competitive judgment of performance, appropriate use of mutual support groups.
11. Emphasize experiential, participative and projective instructional methods, appropriate use of modeling and learning contracts.
12. Make the moral distinction between helping the learner understand his/her full range of choice and how to improve the quality of choosing vs encouraging the learner to make a specific choice.

Theory of Andragogy of Malcolm Knowles

Malcolm Shepherd Knowles (1913 - 1997) was an American educator well known for the use of the term Andragogy as synonymous to adult education. According to Malcolm Knowles, andragogy is the art and science of adult learning, thus andragogy refers to any form of adult learning.

In 1984, Knowles suggested 4 principles that are applied to adult learning-

1. Adults need to be involved in the planning and evaluation of their instruction.

2. Experience (including mistakes) provides the basis for the learning activities.

3. Adults are most interested in learning subjects that have immediate relevance and impact to their job or personal life.

4. Adult learning is problem-centered rather than content-oriented.

In 1980, Knowles made 4 assumptions about the characteristics of adult learners (andragogy) that are different from the assumptions about child learners (pedagogy). In 1984, Knowles added the 5th assumption.

1. **Self-concept-** As a person matures his/her self-concept moves from one of being a dependent personality toward one of being a self-directed human being

2. **Adult Learner Experience-** As a person matures, he/she accumulates a growing reservoir of experience that becomes anincreasing resource for learning.

3. **Readiness to Learn-** As a person matures his/her readiness to learn becomes oriented increasingly to thedevelopmental tasks of his/her social roles.

4. **Orientation to Learning-** As a person matures his/her time perspective changes from one of postponed application ofknowledge to immediacy of application, and accordingly his/her orientation toward learningshifts from one of subject- centeredness to one of problem centeredness.

5. **Motivation to Learn-** As a person matures the motivation to learn is internal (Knowles 1984)

Application of andragogy in personal training of adult individual–

Knowles (1984) provide an example of applying andragogy principles to the design of personal training-

1. There is a need to explain the reasons specific things are being taught (e.g., certain commands, functions, operations, etc.)

2. Instruction should be task-oriented instead of memorization -- learning activities should be in the context of common tasks to be performed by the others.

3. Instruction should take into account the wide range of different backgrounds of learners; learning materials and activities should allow for different levels/types of previous experience with computers.

4. Since adults are self-directed, instruction should allow learners to discover things and knowledge for themselves without depending on people, and will be provided guidance and help when mistakes are made.

Pedagogy Vs Andragogy :

The principles of Andragogy further may be comprehensive from the following comparison of Pedagogical vs Anagogical Learning Assumptions, adapted from It's Called Andragogy by S. P. Forrest and T. O. Peterson, 2006

Assumption	**Pedagogy**	**Pedagogy**
Self-Concept	Learners are unable to self-assess and are dependent on others to define their needs.	Learners know what they need to learn based on self-awareness.
Learner Experience	Learners do not use minimal past experiences as a resource for learning.	Learners leverage past experiences as a base for the learning process.
Readiness to Learn	Willingness to learn is external and the need to know is instilled by others over time.	Learning needs are internal and driven by social roles and responsibilities.
Learning Orientation	Subject and Teacher Centered.	Student Centered and based on tasks or problems.
Motivation to Learn	Motivation is based on extrinsic performance awards and behavior.	The more one matures, the more internalized the learning motivation.

There is no such teaching strategy where a teacher or a tutor can apply exclusively either pedagogy or andragogy but knowingly or unknowingly, we do use both in combination in most of the cases. But very commonly speaking teaching learning for school children is majorly driven by pedagogical principles while in adult learning or training the manpower for specific skills andragogy is more pertinent from application point of view.

1.6 Summary

In this Unit you have learnt :

- Pedagogy refers to that set of instructional techniques and strategies which enable learning to take place and provide opportunities for the acquisition of knowledge, skills, attitudes and dispositions within a particular social and material context.
- Pedagogical practice, may be of three main type A Structured Approach, An Open Framework Approach, A Child-led Approach, on the other, the approach of pedagogical studies is of social pedagogy, Critical pedagogy, culturally responsive pedagogy and Socratic pedagogy.
- The nature of pedagogy is critical and evolving. It may be includes-serious consideration to pupil voice, depend on behaviour (what teachers do), knowledge and understanding (what teachers know) and beliefs (why teachers act as they do), build on pupils' prior learning and experience, involve scaffolding pupil learning, focus on developing higher order thinking and metacognition, and make good use of dialogue and questioning in order to do so, embed assessment for learning, and inclusive and take the diverse needs of a range of learners, as well as matters of student equity, into account.
- The scope of Pedagogy is wide and is ever-growing. Though major focus of scopes should include- Understanding Child, instructional strategy of teaching learning, Inclusive Learning and Development Services, understanding of what is informing our practice, Policy context that focuses on quality and continuous improvement of teaching-learning and Spirit of enquiry and professional dialogue for teacher.
- The philosophical foundation of pedagogy helps to determine the driving purpose of education, as well as the roles of the various participants. While all foundations propose to set goals of education in general, philosophy presents the manner of thinking from which those goals are created. For developing any relevant pedagogical framework, it is needed to consider the relevant contemporary philosophical thoughts.
- Sociological ideas/thoughts largely impact the kind of pedagogy we should design and practice in the school system. Social thoughts advocate majorly the use of project method, socialized techniques, Group discussion and techniques of group

dynamics. Sociological foundations also encourage cooperative learning, problem solving and democratic methods of teaching learning in practicing pedagogy.

- It is the psychological foundations of approach and method of teaching-learning which hold the greatest importance because it is here that we understand how students learn; how to increase student motivation and satisfaction; how to achieve outcome-based learning. The different psychological foundations which are potentially impacting pedagogical practices could be broken down into four categories: behaviourism, constructivism, social constructivism, and liberationism. Amongst all these, two strand of constructivism namely cognitive constructivism and social constructivism are majorly appreciated in global scale.
- The term andragogycan be supposedly equivalent to the term pedagogy. Andragogyin Greek means the man-leading in comparison to pedagogy, which in Greek means child-leading. The principles of Andragogy differ with pedagogy in reference to Self-Concept, Learner Experience, and Readiness to Learn, Learning Orientation and Motivation to Learn. Andragogy principles are very much instrumental to the design of personal training of adult.

1.7 Self-Assessment Questions

1. Make a critical note on different approach of Pedagogy
2. Explain the critical nature of pedagogy
3. Make a comprehensive note on the scope of study of pedagogy
4. Differentiate between Pedagogy and Andragogy in terms of principles
5. Discuss in brief the major implications of sociological thoughts on pedagogy.
6. How cognitive constructivism differs from social constructivism
7. Make a note on the limitations of behaviourism.
8. How can Andragogy be instrumental in personal training of adult individuals?
9. Make a critical note on the evolving nature of pedagogy with the ongoing research in psychology, brain research and ICT.
10. Judge the Liberationist pedagogy in the contemporary social context.

1.8 References

Barber, M., &Mourshed, M. (2007). How the World's Best Education Systems Come Out on Top, London &NewYork, McKinsey.

DEEWR. (2009). Towards a national quality framework for early childhood education and care: the Report of the Expert Panel on Quality Early Childhood Education

and Care. Department of Education, Employment and Workplace Relations Commonwealth of Australia.Moyles,

Farquhar, S. E. (2003). Quality Teaching Early Foundations: Best Evidence Synthesis. New Zealand Ministry of Education.

Farquhar, S., & White, E. J. (2014). Philosophy and pedagogy of early childhood. Educational Philosophy and Theory, 46:8, 821-832. https://doi.org/10.1080/00131857.2013.783964. Accessed on June 02, 2020.

Fleer, M. (2010). The re-theorisation of collective pedagogy and emergent curriculum. Cultural Studies of Science Education, 5(3), 563-576.

Forrest, S. P., & Peterson, T. O. (2006). It's called andragogy. Academy of management learning & education, 5(1), 113-122.

Freire, P. (1993). Pedagogy of the Oppressed. New York: Continuum International.

Freire, P. (2013). Pedagogy of the oppressed. Routledge.

Hooks, B. (1996). Teaching to transgress: Education as the practice of freedom. Journal of Leisure Research, 28(4), 316.

Husbands, C., & Pearce, J. (2012). What makes great pedagogy? Nine claims from research. National College for School Leadership. Retrieved from www.education.gov.uk/nationalcollege. on June 02, 2020.

Jonassen, D. H. (1994). Thinking technology: Toward a constructivist design model. Educational technology, 34(4), 34-37.

Jonassen, D. H. (1994). Thinking technology: Toward a constructivist design model. Educational technology, 34(4), 34-37.

Knowles, M. S. (1984). Andragogy in action.

Leahy, S., et al. (2005). Classroom assessment: Minute by minute, day by day. Assessment to Promote Learning, 63, 19-24.

Liberationist Pedagogy: Pedagogies of Liberation, Available at. https://www.jesusradicals.com/pedagogies-of-liberation.html. Accessed on June 02, 2020.

Machin, S. & Murphy, S. (2011). Improving the Impact of Teachers on Pupil Achievement in the UK: Interim Findings, London, Sutton Trust.

Mezirow, J. (1981). A critical theory of adult learning and education. Adult education, 32(1), 3-24.

Moyles, J., Adams, S., & Musgrove, A. (2002). Using reflective dialogues as a tool for engaging with challenges of defining effective pedagogy. Early Child Development and Care, 172(5), 463-478. https://doi.org/10.1080/03004430214551.

National Curriculum Framework (2005) .https://ncert.nic.in/pdf/nc-framework/nf2005-english.pdf Accessed on June 04, 2020.

Persaud, C. (2019). Pedagogy: What educators need to know. Uploaded March, 1, 2019. https://tophat.com/blog/pedagogy/ Accessed on April 12, 2020.

Richardson, V. (Ed.). (1997). Constructivist teacher education: Building new understandings. Psychology Press.

Schwartz, R. (2009). Attracting and retaining teachers. OECD Observer. Available at www.oecdobserver.org/news/fullstory.php/aid/2235/ Accessed on June 04, 2020.

Siraj-Blatchford, I., Muttock, S., Sylva, K., Gilden, R., & Bell, D. (2002). Researching effective pedagogy in the early years. Department for Education and Skills, Research Report: RR356. https://www.academia.edu/download/30902717/RR356.pdf/ Accessed on November 24, 2021.

Tippins, D. J., Tobin, K. G., & Hook, K. (1993). Ethical decisions at the heart of teaching: Making sense from a constructivist perspective. Journal of moral education, 22(3), 221-240.

Tobin, K., &Tippins, D. (1993). Constructivism as a referent for teaching and learning. The practice of constructivism in science education, 1, 3-22.

Vygotsky, L. S. (1978). Mind in society: The development of higher mental processes (E. Rice, Ed. & Trans.)

Westbrook J, Durrani N, Brown R, Orr D, Pryor J, Boddy J, Salvi F (2013) Pedagogy, Curriculum, Teaching Practices and Teacher Education in Developing Countries. Final Report. Education Rigorous Literature Review. Department for International Development. University of Sussex.

Žogla, I. (2018). Science of pedagogy: Theory of educational discipline and practice. Journal of Teacher Education for Sustainability, 20(2), 31-43.

Unit–2 : Pedagogy and Teaching

Structure

2.1 Objectives

In this Unit, we have tried to introduce you to the basic concepts of Pedagogy as 'Art and Science of Teaching. After familiarizing you with basic concepts we lead to the art of science of teaching with exemplifications. After the end of this unit, you should be able to :

- Explain Pedagogy as Art and Science of Teaching
- Comprehend Pedagogy as the Art of Teaching
- Comprehend Pedagogy as the Science of Teaching
- Explain when Pedagogy is arts and when Pedagogy is science
- Explain how the art and science of teaching are related with each other from the perspective of application.

2.2 Introduction

In this unit of course structure, the core concept of pedagogy is being discussed. Teaching is a performing art. Teaching is a creative organic evolving process where the teacher engages himself herself as a co-learner with the students. But such engagement demands a lot of science and aesthetics. We present here the ideas so that you can understand the concept of art and science of teaching. We will also expose you to the concept of andragogy and how it differs from pedagogy.

2.3 Pedagogy as the Art and Science of Teaching

Pedagogical process is a deliberate process of intentional teaching and learning is a process for living (Dewey, 1963); based on specific regularities and theoretical assumptions organized process of education has to mediate the learning and developing persons with their environment. Knowledge of education and educational knowledge are complex phenomena that require integrated and updated understanding of humanities and social sciences, including large components of educational practice with the growing amount of knowledge. Therefore, pedagogy is interdisciplinary, it functions as the theory or science and teachers' professional philosophy, academic discipline and practice, meets the general requirements to achieve educational, developmental and educative goals in their integrated quality; and these are in compliance with the integrity of human's physical, mental and social nature.

The 20th century theory of action in psychology (Leontyev, 1977) added to Dewey's learning by doing has become fundamental for the development of pedagogy:

a) Interpreted from pedagogical perspective assumption that a human being develops all his/her faculties through different kinds of activities (Schukina, 1986);

b) Implemented in didactic assumption that spirits and emotions are the center of harmonious development (Petersons, 1930).

The concept of many-sided and harmonious development contributed to pedagogy, coupled by understanding that development occurs by changing-improving-empowering learner's learning as an essential activity; the latter, therefore, must be pedagogically designed, organized, and equipped so that the learner is the subject of his/her activity, development and socialization. Teacher's assistance, cooperation and communication create an appropriate supportive environment for the learner's many-sided, harmonious, autonomous learning and better achievements in his/her development with growing amounts of knowledge; pedagogic theory is especially about relationships (Petrie et al., 2006,). The nature of human development, actually, does not allow for reducing pedagogy to teaching only. Here we have come to the object of the science of pedagogy being constant links between learner, teacher, and the content of activities/learning in often specially organized environments; these links manifest themselves in relationships. Now pedagogy as science distinguishes between the object of research to be investigated for better understanding of the practical aim or overarching educative goal of pedagogy as a process of teaching-learning. The core understanding of the science of pedagogy in has developed by overcoming temporal innovations in the cultural context and by recognizing some constant values of the classical conception, mostly evolved in Europe, of pedagogy being incorporated from the following groups of sources:

oValues and pedagogical thought developed through ages being inscribed in multiple folk songs (268,815 verses, registered as The Cabinet of Dainas, the UNESCO Memory of the World) constitute a strong cultural and moral component that manifests itself in common and highly respected human attitudes. Long-lasting practices, visions and philosophical views on education demonstrate sustainability in constant innovations and are revealed in pedagogy since the first school in the Baltic countries in Riga (1211) and organized teacher education (1683).

● Research related to pedagogy since the 17th century accentuated the empirical investigations (Dauge, 1929, 99); the rise of anthropology as a science with pedagogy sitting within it (Kron, 2001) has formed research at the University of Latvia in 1919 when it became focused on the holistic essence of pedagogical process by following the humanistic paradigm with the learner's mental development at the core and the empirical approach which followed the paradigm of the natural sciences; pedagogy develops scientific research and research-based studies (Hessens, 1929, 124) mainly by reflecting and investigating practices, creating a scientific method, categorization, and developing other essential features of a science.

● Thanks to the long-lasting orientation of pedagogy towards philosophy and its search for fundamental background assumptions and theories, academic components developed to become part of pedagogy in the 19th century (Depaepe, 2002, 363). Philosophy and history have formed the background of many educationists (Husen, 1979); their understanding of pedagogy in its theoretical and practical capacity has developed an academic discipline (in tertiary and doctoral programmes); pedagogy has stepped beyond just teaching methods to reach the quality of science of pedagogy now being a teachers' personal philosophy that manifests itself in their professional behaviours.

Pedagogy is generally regarded as the 'art and science of teaching'. Pedagogy encompasses the psychological, cultural, political and socio-emotional processes of teaching young children, and is not to be confused with curriculum (Ryan & Hornbeck, 2007). Craft (2005), defines pedagogy 'as encompassing appropriate and defensible professional judgments about how teaching is undertaken and learning nurtured', implying that pedagogy requires a sound theoretical basis. Pedagogy is influenced by classroom and school contexts; the expectations and assumptions of administrators and parents about teachers and teaching; and changing ideas about the nature of teaching. Pedagogy is considered in terms of relationships between teacher and learner. Pedagogy is seen as encompassing teaching strategies and learner responses; socio-emotional interactions between teachers and learners; the impact of teachers' educational philosophy on their teaching; and the mediating effect of the physical learning environment.

'Pedagogy' is the practice of teaching informed and framed by a shared and structured body of knowledge. This knowledge comprises experience, evidence, understanding moral purpose and shared transparent values. It is by virtue of progressively acquiring such knowledge and mastering the expertise - through initial training, continuing development, reflection and classroom inquiry and regulated practice - that teachers are entitled to be treated as professionals. Teachers should be able and willing to scrutinize and evaluate their own and others' practice in the light of relevant theories, values and evidence. They should be able to make professional judgments which go beyond pragmatic constraints and ideological concerns, and which can be explained and defended.

Furthermore, pedagogy is impoverished if it is disconnected from the capacity and responsibility to engage in curriculum development and to deploy a range of appropriate assessment methodologies. Indeed, in most European countries, these elements are treated as a whole, enabling a broad conception of pedagogy, while in India we are trying to adapt this practice. Teachers should be knowledgeable about curriculum and assessment principles as a part of their pedagogical expertise. To promote the further development of professional expertise, it is needed to include these dimensions, and the interrelationships between them, in the conceptual framework of frame work for school education and for teacher education.

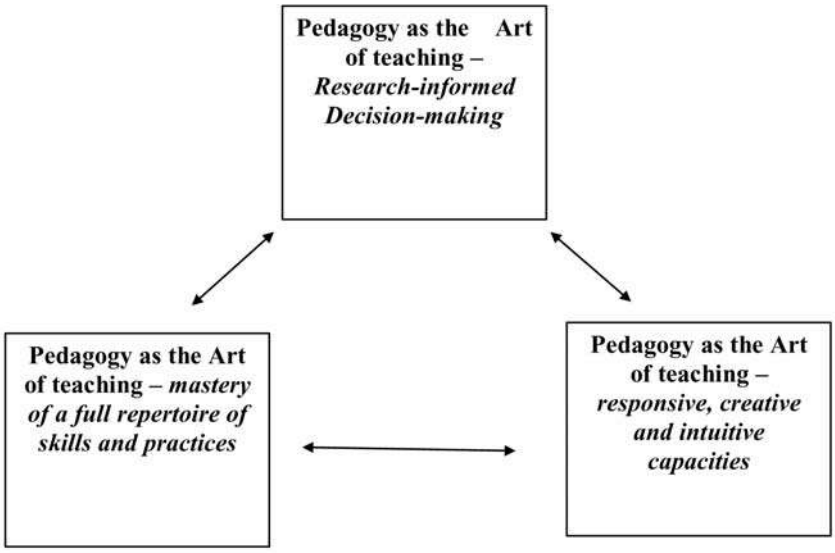
On the basis of above mentioned understanding about pedagogy, it could be said that pedagogic expertise can be thought of as a combination of science, and art; this notion helps us to understand the complementary needs for collectively created knowledge, professional skills and personal capacities. It is also important to remember that all these are grounded in ethical principles and moral commitment - teaching is never simply an instrumental activity, a question just of technique.

One of the challenges for pedagogical discourse is to distinguish between what is known in a scientific sense of being explicit, cumulative and generalizable, and what are the irreducibly intuitive and creative elements of teaching. It is generally accepted now that good teaching requires strategic decisions informed by evidence, which is the science of teaching. But it also requires a large number of implicit and often instantaneous judgments and decisions. These are responses to the dynamic situation in the classroom, often shaped by the 'community of practice' to which the teacher belongs. They are also expressions of each teacher's individual relationship with his or her pupils: how he/she generates a positive classroom climate or takes advantage of unexpected teaching and learning opportunities. This is the 'art' of teaching.

2.4 Pedagogy as the Art of Teaching

We all need to acknowledge this paradox of teaching - that the more expert a teacher becomes, the more his/her expertise is manifested in sensitivity to contexts and situations, in imaginative judgments in-the-moment sourced from tacit knowledge. The importance of these forms of expertise is often underestimated. Indeed, they often become so embedded, instinctive and taken-for granted that they are barely recognized.

Pedagogic expertise can be thought of as a combination of science, craft and art; this notion helps us to understand the complementary needs for collectively created knowledge, professional skills and personal capacities. It is also important to remember that all these are grounded in ethical principles and moral commitment - teaching is never simply an instrumental activity, a question just of technique.



The goals of education are established in a national curriculum and in more detailed institutional curricula. In many countries, for example, in Finland, the goal of education is to support the development of the whole personality, rather than merely the cognitive domain. In this kind of holistic approach, human beings are lifelong learners who need to be educated in all educational domains to actualize their full potential. These domains include three domains in learning as identified by Benjamin Bloom: cognitive, affective and psychomotor. Many learning tasks, for example, the skills related to morality, require teaching and learning in both cognitive and affective domains. In this chapter we discuss how pedagogy, the science and art of teaching, can promote the educational goals identified in the curriculum.

We can identify two different curriculum traditions influencing national curriculums in different countries. The Bildung tradition aims at educating individuals to become competent citizens who actualize their individual talents and also benefit the society with their competences. Bildung advocates the importance of individual and society transformation through education. In Europe and Nordic countries, Didaktik is a curriculum tradition guided by the philosophy of Bildung and the idea of educating instruction, in educational institutions. In that tradition, the pedagogical relation between the teacher and students, the content relation of a teacher to the subject matter and the didactic relation of a teacher to students' learning are seen as core elements in the teaching-studying-learning process.

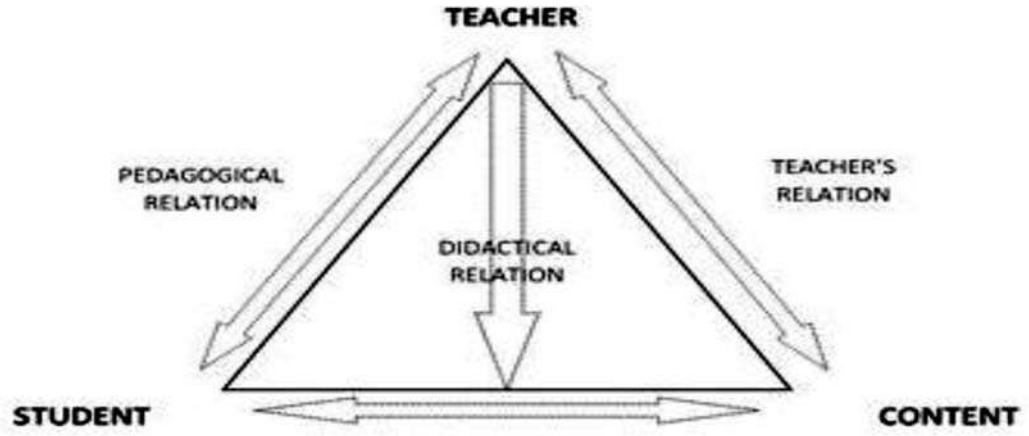


Fig: The basic elements & relationships in Didactical Triangle (Tirri& Toom, 2019)

In this Didaktik curriculum tradition both the teacher and the students have autonomy in teaching-studying-learning process that cannot be restricted by any legislation or evaluation. The teaching is guided by a "Lehrplan" that can only be implemented by a competent teacher who has total freedom to choose her teaching contents and methods. The goals of curriculum and teacher's skills to actualize those goals in her teaching are the ways to evaluate the success of a teacher.

The Anglo-American curriculum tradition is based on psychological theories on learning, and the emphasis is on accountability and learning outcomes. The curriculum and the teaching plans are well-articulated and detailed with the goals to achieve the learning objectives with clearly defined contents. The teachers are trained to teach certain contents with the goal to produce good learning results that can be measured objectively with standardized tests. Teachers are certified after their training, and they are evaluated regularly on the basis of their students' learning outcomes. Teachers' task

is to implement the given national curriculum and achieve the learning objectives listed in them.

The didactic curriculum tradition in which values and morals are emphasized in guiding the teaching-studying-learning process and in educating pupils as whole. This means that pedagogy is moral in nature, and the teacher's main task is to reflect the values underlying her teaching and the purposes she wants to advance in her teaching. In addition to the values established in the national curriculum, the teacher needs to be aware of the ethical codes guiding the teaching profession. The professional status of teachers differs from country to country. In Finland, for example, teachers are considered ethical professionals who can be trusted and who share similar basic values about their work. These values are established in the ethical codes for teachers, which were first published in Finland in 1998. The values are dignity, truthfulness, fairness, responsibility and freedom. In 2017 the Teachers' Union in Finland continued to strengthen the professional status of its members and established the Comenius' Oath for teachers. The purpose of this oath was to support teachers and provide a concrete reminder of the ethical foundation of their profession. The freedom given to teacher's challenges them constantly to develop their ethical skills with regard to their students, colleagues, themselves and the networks with which they cooperate. In this pedagogical challenge, teachers need ethical sensitivity to identify and solve context-specific moral dilemmas in teaching.

Shulman argues that a teacher's knowledge of ends, purposes and values of education is perhaps the most important part of teachers' professional knowledge. This kind of knowledge includes the following issues: the visions on what is possible in pedagogy, how a pedagogically well-functioning school might look like, what the students should become and how good education can be defined. In Finland, for example, the holistic growth of students is emphasized in the national curriculum with the aim to educate them to be good citizens who contribute to the society with their talents. This goal of education assumes that the teacher has internalized the values and purposes in education and can actualize them in her teaching. In addition to these general pedagogical values, the teacher needs to be aware of the subject-specific values of each subject taught. A current pedagogical challenge for Finnish teachers includes the task of curriculum integration.

According to Niemelä and Tirri the need for an integrated curriculum emerges from current ethical and social issues in the world. Curriculum integration can be applied, for example, to teaching what climate change means and what can be done to stall, if not reverse it. Curriculum integration can also advance democratic education in schools with a pedagogical purpose of meeting the needs of diverse students.

To be able to act as an ethical professional with a long-term commitment, a teacher needs a personal purpose for her work. William Damon and his colleagues have defined the term "purpose" as "a stable and generalized intention to accomplish something that is both meaningful to the self and of intended consequence to the world beyond the self". Tirri argues that to meet the criteria of a purposeful teacher, three criteria need to be met. They include intention, engagement and prosocial reasoning. Purposeful teachers are those professionals who have internalized the moral core of pedagogy and the long-term goals in education. Those goals need to be both personally meaningful for a teacher and at the same time go beyond herself to serve her students holistic growth.

Vygotsky (1967/2004) defines imagination as the ability of the mind to combine perceptions from reality into new forms through processes of disassociation and association, developed through the emotions. Warnock (1976, p. 10) describes imagination as 'that which creates mental images', a function that is activated in ordinary perceptions of our environment. These perceptions may be emotional as much as they are intellectual. White (Egan & Judson, 2009) characterises imagination as 'our ability to think of the possible'. Gallas (2001, p. 460) states that creativity is 'action in the mind and the world', or a further transformation of images and ideas formed by the imagination. Robinson (2006) argues that creativity is a process of having original ideas of value.

According to Vygotsky (1967/2004, p. 71), play is the initial expression of imagination and 'the root of all creativity in children', followed by drawing and storytelling. In these three forms, elements of reality gained from prior experience are combined in new ways to meet children's desires and interests. Several scholars posit that imagination, thinking and learning are imbued with emotion, and it is at this intersection that creative responses emerge (Bodrova& Leong, 1996; Egan 2005; Vygotsky, 1967/2004). Research in neuroscience supports this assertion, describing the nexus between high reasoning and emotion as the basis for creativity and learning (Immordino-Yang &Damasio, 2007). Burnard et al (2006) research identified some features of 'possibility thinking' in young children in early years settings. This thinking involves posing questions, play, immersion, innovation, risk-taking, being imaginative and exercising self-determination.

Artistry of Teaching Learning :

Recent research about teaching for imagination and creativity in educational contexts has focused on child development, literacy learning and play in the pre-school years. Rather than relying on the long-held view that children's prior knowledge should be the basis for all new knowledge, Kieran Egan (2003) took the provocative stance of

considering what the child can imagine as the starting point for learning. Smith and Mathur (2009) recently offered a comprehensive review of research into the developmental effects of imaginative activity on children from preschool to adolescence. The authors found that children showed increased emotional regulation, empathy and cognitive ability when engaging in play, and language, literacy and drama activities designed to elicit imaginative responses. Gallas' (2001) extensive ethnographic research in school settings positioned imagination as central to literacy learning, and argued that teaching 'must become an imaginative, inside/out process that places student action and interaction at the center'. These findings challenge traditional teacher control of the classroom as children collaborate and improvise, and the teacher immerses her/himself in play with children, using a less scripted pedagogical stance (Gallas, 2001). Recent research into play pedagogies in the pre-school years, prioritized adult-child interactions and co-construction of meaning (Goouch, 2008; Lindqvist 2003). Similarly, Kudryavtsev (2011) noted the key role of teachers in engaging children creatively. Further support for this prioritizing comes from the findings of Bilton (2012) and Siraj-Blatchford (2010) who pointed to the role of teacher-child interactional quality in promoting children's thinking. The present study does not address specific curriculum areas, however, as the previously cited literature indicates, play and adult-child interactions are likely to be relevant to the study of children's imagination and creativity. Further to studies about curriculum areas and play, researchers have been interested in conceptual ideas about teaching for imagination and creativity that translate into classroom strategies.

Researchers have expressed concern about the effect on children's imagination and creativity of pedagogy that separates intelligence and creativity (Robinson & Azzam, 2009). Robinson (2006) condemned schools for penalizing children's mistakes, as it is the willingness to risk being 'wrong' that gives license to creativity. Sternberg (2003) proposed that teachers and learners conceptualize the development of creativity as essentially a 'decision-making process'. He stated that strategies that enable teachers and learners to choose creativity include the tolerance of ambiguity; encouraging sensible risk taking; teachers modeling creative thinking; helping children believe in their creativity; allowing mistakes; teaching children to consider others' perspectives; and giving time for creative thinking. Research on the use of these strategies has found that their use improved school achievement (Sternberg, 2003). These studies, however, were conducted with children over eight years of age, with some participants identified as gifted. Further research on teaching is required on younger children and children in mainstream classrooms.

Researchers in the United Kingdom have paid considerable attention to pedagogies that promote children's imagination and creativity. Woods' (1990) research into the

practices of creative teachers found four factors, innovation, ownership, control and relevance, to be central to their pedagogy in school settings. Research conducted in preschool and early years settings has found that teaching for creativity involves 'the passing of control to the learner and the encouraging of innovative contributions'; teachers valuing learners' 'ownership and control'; 'encouraging children to pose questions, identify problems and issues'; 'offering children the opportunity to debate and discuss their thinking'; 'encouraging children to be co-participant in learning'; and 'prioritizing learner agency' (Jeffrey & Craft, 2003, Craft, 2005). Jeffrey and Craft (2004) used Woods' (1990) framework to examine the distinction between teaching creatively and teaching for creativity, finding that this dichotomy does not reflect the reality of teaching. The authors suggested that research should focus on the experiences of the learner and the teacher (Jeffrey & Craft, 2004).

Cremin, Burnard, and Craft (2006, p. 108) have described, from the perspectives of early years teachers, the pedagogy of 'possibility thinking', or that which can be imagined. The findings revealed three common strategies. 'Standing back' refers to teachers literally removing themselves from involvement in children's activities to observe emerging understandings. 'Profiling learner agency' describes teachers as resources that can advance children's thinking, by ensuring children have many opportunities to make choices about their learning. The authors also identified 'creating time and space', which is the ability of the teacher to 'stretch' time to allow deep immersion in the learning experience to ensure the physical space of the classroom affords opportunities for learning (Cremin, Burnard, & Craft, 2006, p. 115-116). The findings of these key studies contributed to the data analysis process in the present research.

An effective teacher has a wide-ranging repertoire of different teaching and learning models, strategies and techniques and knows how to create the right conditions for learning. The choice is determined by the nature of the learning objective. The Key Stage 3 National Strategy booklet Key messages: Pedagogy and practiceprovides guidance on the relationship between pedagogic approaches (teaching models), teaching strategies, techniques and methods of creating the conditions for learning in order to inform lesson design. The units are divided into four distinct colour-coded categories: Designing lessons, teaching repertoire, creating effective learners and creating conditions for learning. The units in the Creating effective learner's category support the three Key Stage National Strategy of whole-school initiatives. The study guides do not require teachers to attend any external course, although they do complement the Key Stage three National Strategy's training. A unit requires about five hours of study and five hours of work in the classroom. Each contains :

- A clear presentation of the main ideas;
- Case studies;
- Tasks and classroom assignments;
- Practical tips;
- Opportunities for reflection;
- A summary of related research;
- Suggestions for further professional development and guidance;
- An opportunity to set future targets, perhaps related to performance management;
- Accompanying video sequences.

Scope of Pedagogy as Art of Teaching :

A. Designing lessons Unit :

Structuring learning : This key unit provides teachers with a model for the process of designing lessons. It starts by considering factors affecting lesson design, including the influence of the type of learning objective on the choice of approach. It goes on to explore effective methods of sharing learning objectives with pupils. There is guidance on how to structure learning by splitting lessons into a series of episodes, and on choosing from a range of strategies and techniques to motivate pupils. Finally, there is an examination of three pedagogic approaches - direct interactive, inductive and exploratory - to show how they can help pupils develop tools for learning, such as inductive thinking or enquiry skills.

Teaching models : This unit develops further the principles and practice of teaching reviewed in unit 1. It explores a range of teaching models and encourages teachers to review their teaching practice against the models described. For each teaching model outlined, episodes are clearly defined showing how the model might be applied in classrooms. There are also some examples to illustrate ideas, and the importance of metacognition within each is made explicit. This will enable pupils to use the technique to support their own learning.

Lesson design for lower attainers : This unit explores a range of strategies and techniques that will help pupils who tend to learn more slowly. It demonstrates the importance of 'assessment for learning' - research has shown that lower-attaining pupils, in particular, make significant gains when these techniques are used. There are also guidelines on developing literacy and numeracy skills in the context of different subjects, and on strategies for aiding recall.

Lesson design for inclusion : This unit considers some principles for ensuring the inclusion of all pupils in lessons, and how to hold them all into the learning process.

It provides a first insight into the needs of many groups that need to be included, such as boys, EAL, lower attainers, gifted and talented and SEN pupils. It considers various episodes in a lesson, such as starters and plenaries, and some early strategies that help to ensure all pupils are actively engaged and are able to make progress in their learning in all subjects.

Starters and plenaries : The beginnings and ends of learning sequences are important. This unit describes the purpose and importance of starters and plenaries at the beginnings and ends of lessons, and also within lessons as part of teaching episodes. It provides a range of strategies and ideas as well as guidance on planning and making starters and plenaries effective.

B. Teaching repertoire

Modeling : Modeling is a powerful strategy that can be used across all subjects to help pupils to learn and to develop confidence in a new skill or procedure. This unit sets out the principles of this strategy and provides guidance on how to introduce modeling into lessons and make it effective.

Questioning : This unit outlines the different types and purposes of questioning. It explains how to organize questioning for whole-class and group work, and offers strategies such as providing 'wait time' for making it effective. Bloom's taxonomy is used to provide a framework for planning questions that challenge and develop pupils' thinking. Alternatives to direct questioning are also explored.

Explaining : This unit looks at the purpose of explanations in teaching and outlines the characteristics, features and skills of successful explanations. It explores different types of explanation, how to plan for them, which strategies are effective - particularly for those involving abstract ideas. It also provides guidance on how to support pupils in planning and articulating their own successful explanations.

Guided learning : This unit explores how the principles and approaches involved in guided reading and writing can be used to support guided learning in subjects across the curriculum. It describes an instructional sequence for the teacher working with small groups, which is integrated into lessons to act as a bridge between whole-class teaching and independent work. It provides a range of examples and addresses practical questions of organization including time, classroom layout, management of behaviour and resources.

Group work : This unit looks at how effective group work can help to improve pupils' speaking, listening, thinking, problem-solving and social skills. It emphasizes the need for establishing clear rules and procedures and sets out a range of techniques to ensure pupil engagement and cooperation, such as allocating roles and setting group

targets. Methods for structuring group work, such as 'snowballs', 'jigsaws', 'envoys' and 'rainbows', are suggested and the benefits and limitations of different grouping criteria explored.

Active engagement techniques : This unit explores what is meant by engagement and why it is important. A range of strategies to motivate and engage pupils is examined, for example directed activities related to text (DARTs) to promote active reading, strategies to promote active listening, thinking strategies, and the use of drama across subjects.

C. Creating effective learners

Assessment for learning: This unit explores what is meant by assessment for learning and its importance. It explains how good assessment practice can contribute to better learning and higher achievement. This unit focuses on the key characteristics of assessment for learning and examines a range of practical strategies for incorporating these principles into classroom routines.

Developing reading : This unit focuses on improving pupils' ability to understand and to respond to written texts. It considers teaching subject-specific vocabulary; how teachers can support pupils by clarifying the approach they need; how pupils need to access their prior knowledge before they read; some of the ways pupils can be encouraged to engage with text and some aspects of notetaking. It shows how the teacher can use shared and guided reading to enable pupils to develop more independence and skill as readers.

Developing writing : This unit focuses on improving the quality of pupils' writing through actively teaching the techniques they will need. Pupils write best when they know what, how and why they have to write. Writing is often best taught through teacher modeling and then sharing the writing with the class. The route is from examples, modeled and shared work, through guided writing to independence.

Using ICT to enhance learning : The use of ICT in classrooms enhances learning and teaching. This unit looks at the relationship between teachers' use of ICT as a medium for teaching and the development of pupil capability. There are guidelines on the use of classroom support assistants and technicians, on classroom management and on organization in the ICT-rich classroom.

Leading in learning : This unit provides an introduction to thinking skills by clarifying the nature of higher-order thinking and different approaches to 'teaching' thinking. It also provides practical guidance for improving the teaching of aspects of thinking skills lessons, such as improving the teaching of the plenary, helping pupils to see the relevance of thinking in everyday contexts and developing their use of 'thinking words'.

Developing effective learners: Through the use of case studies, this unit explores what is meant by an effective learner, what learning skills might be expected of pupils at each key stage and how learning skills can be developed within subjects.

D. Creating conditions for learning :

Improving the climate for learning: The physical environment can make a significant difference to learning, and this unit explores how even small changes to the classroom can help. It looks at arranging furniture to suit the teaching approach and creating displays that really contribute to learning. Teacher-pupil relationships are another important factor in classroom climate, and the unit also describes how pupil expectation and motivation can be improved through the use of appropriate classroom language.

Learning styles : This unit outlines some of the current thinking and research on learning styles. It provides advice on how to identify different learning styles but, more importantly, emphasizes the need to provide a variety of activities to suit different styles, over time. There is guidance on how to plan and adapt activities to accommodate visual, auditory and kinesthetic learners.

Classroom management : The emphasis in this unit is on developing the concept of teaching behaviour that is conducive to learning. The fundamentals of good pedagogy and practice, which are explored in the other units, are the bedrock of successful teaching and learning. Consideration is given to the core values and beliefs which underpin the teacher's relationships with the pupils. Just as importantly, pupils' perceptions of effective teaching are examined. Pupils respond positively to clear structures and routines, and the teacher's verbal and non-verbal language is pivotal in securing and maintaining relationships for learning.

2.5 Pedagogy as the Science of Teaching :

Understanding Science of Pedagogy

Development of pedagogical practice follows that of the science of pedagogy in the research of scholars working on pedagogy in cooperation with experienced and reflection of practicing teachers, who have developed theory and pedagogical process with its complex character and traditional culture-oriented education focused on an individual's overall development as a person (Dauge, 1932). Learning and teaching as the central actions/activities in pedagogy foster the learner's, as well as teacher's development by using the subject matter as a pedagogical tool, while teaching and learning being implemented in cooperation and communication open new possibilities for value and attitudinal exchange as an educative goal. Teachers, or even parents, can hardly influence the learners' views, values, and ideals in a direct way; rather the

values coming from the external sphere can be facilitated and fostered through the learner's actions and communication and by targeted and meaningful development of the learners' self-conducted action. This conception underpins the learner's position as a subject of his/her activities and teacher assistant's role that manifests itself in a transition from learner-centeredness to learner's learning-centeredness. The latter emphasizes learner's action/activity/learning being an object of teachers' developmental assistance, which if coupled with respecting Learner's individual qualities enables his/her meaningful learning-by-doing (intellectual or physical).

Currently a complex understanding of pedagogy is not limited by European borders. The Gordon's Commission in the USA affirms an integrative understanding: pedagogy,- the central mechanism operative in education is interactively and trans-formatively inclusive of assessment, teaching, and learning (The Gordon Commission, 2012,). Distinguishing between the science of pedagogy and the practice of pedagogy avoids reducing pedagogy to methods of teaching, leads to integrity and educative value of deliberate education in both aspects and as a process and as learner's achievements; this also strengthens the background for pedagogy as a university discipline. Lost integrity functions as an obstacle for achieving competencies; these are complex in their nature.

Competence-oriented education in organized (formal or non-formal) processes does need a clear, stable and strong theoretical background that is provided by the science of pedagogy. The latter in Latvia has developed all basic components to function in a capacity of a science and university discipline, it has attributes which need not be borrowed from other sciences (Gudjons, 1995, 33 – 35). Research is also being successfully developed for this specific area (Pipere et al., 2015).

The development of the science of pedagogy as a European intellectual tradition has been long and saturated; it has been interrupted by the notion of education sciences being a tradition of the Anglophone countries; this reminds that societies live in transmission and education is in constant transformation. Political changes in the early 1990s triggered discussions over the paradigms of education, the essence of pedagogy and education sciences. It is worth reminding that discussions usually aim at more relevant definitions of the phenomena being discussed. By that time pedagogy had already been defined to a certain extent, by accentuating its practical component while education sciences are still waiting to be appropriately defined. Several research projects had been supported by the Latvian Council of Sciences and publications released, among them also in the issues by the Academy of Sciences. Here are some of these: pedagogical regularities (Žogla, 1995), considerations on the definition and object of pedagogical science; research and sub-branches of pedagogy (Kopeloviea&Zukovs, 2001, 1719); the definition and state of matters reported at the

Department of Humanities and Social Sciences of the Latvian Academy of Sciences (Žogla, 2005). A challenging participation in a project on educational studies conducted by Oxford and London Universities () raised the intellectual tradition of Latvia to a world-class discussion on the essence of pedagogy in its three capacities: science, practice and discipline. Over the past decades, attention to pedagogy has been noticeable, and this is evidence of its growing importance and a need to understand the well-structured theory operating in the discrete field of education. Different visions meet by approaching the notion of pedagogy from very different perspectives and conceptual standings (Waring & Evans, 2015): the science, craft and art (Pollard, 2010); the science of teaching (Watkins & Mortimore, 1999), dynamic process, informed by theories (Leach & Moon, 2008), multiple interactions which we call instructional dynamics and a defining feature of education.

Recently a wider understanding of pedagogy appears in the Anglophone countries, and this inspires, as well as helps describe the understanding, in which neither teaching nor learning alone cover the term pedagogy, especially the science of pedagogy with its vast and complicated field of investigation. There is a promising comment that in terms of its European traditions pedagogy entails more than just teaching, it involves two aspects of learning. The first is associated with what and how students are learning; the second is about the teacher as a learner. Thinking about pedagogy in this way helps to highlight teaching as an educative process for both partners in their relationship rather than a set of technical skills (Loughran, 2010, 36 - 37). Thomas Coram Research Unit of London University investigates pedagogy and argues that children and young people are being seen as persons in their own right, rather than as problems to be managed (Petrie et al., 2009). Pedagogy as practice appears when two people with entirely different actions, those of learning and teaching are involved by the program/curriculum; pedagogy as science and its theoretical framework are needed to create a coherent process that is adjusted to the learners' needs. Teachers and learners follow different aims and motives, use different background knowledge and tools, and still their attempts have to be met. This joint venture allows for transitions from a normative to a learner learning-centered process with the learners' meaningful participation in creating, conducting and evaluating the process where the learner has to achieve; that is leading to learners' autonomy in learning and development, as well as to teachers', learners', parents and other stakeholders overcoming the growing complexity and transferring their way of thinking. Only specialists identify that real accomplishments of a pedagogical professional philosophy towards humanistic process, as well as objectives and tools chosen by teachers and adopted by learners appear when the formal inclusion of the both grows into a meaningful engagement. Learners' engagement in classroom and school, university or kindergarten settings with organized

cooperation and communication happens when teachers' assistance actualizes the learners' need for significant activities to accomplish assignments or chosen activities, when academic goals obtain meaning for learners and they achieve new or improve their personal qualities; here sits the object of the science of pedagogy to create adequate mutual relations that initiate a transition in teacher and learner understanding from rather generalized outcome-oriented process to learner achievement-oriented pedagogy.

In the Latvian traditions, the practice of pedagogy creates and the science of pedagogy investigates inner dynamic links between teacher, learner and the content in social, deliberately organized integrative settings where teachers' and learners' activities and communication are mutually dependent, their orchestrated actions and communication lead to the learners' autonomy. Teachers' and learners' reflection and self-evaluation add to the achievements of the both, as well as to the educative value of the process.

Research, therefore, attempts to detect pedagogical regularities in diverse settings and confront the criteria that confirm the constants, find not only a synthesis between pedagogy and the ever-changing disciplines that relate to it, but also to transform or translate the theoretical assumptions of these disciplines into pedagogical notions when two responsible people, the teacher and learner, analyses, co-construct the pedagogical process and co-operate on a basis of solidarity (Klafki, 1990, 95). Debates and disagreements over the form, content, and control of educational knowledge are central to understanding the discipline (Furlong, 2013); the new teacher education ìrests on a multidisciplinary theoretical framework (Cochran-Smith, 2005); it exists in transitions and therefore needs a key juncture. All this knowledge and understanding, pedagogical professional thinking and the ability to operate professionally should be learned by teacher students; the essence of a quality university discipline exists in a research-based transition from acquiring the profession to a self-directed creation of professional competencies. J. J. Paget's and L. Vygotsky's theories have been well-known since the 1930s and used to underpin the investigations towards understanding the practice and science of pedagogy. The theory of the zone of proximal development was especially productive for pedagogy as a teachers' philosophy-in-use: learning always precedes development and pulls along the learners' experience (Vygotsky, 1978). This concept highlights where the learner's autonomous learning slows down due to his/her limited possibilities and how assistance can speed it up, empowering further learning by addressing his/her experience, preserving its developmental and motivating value, and by doing so creating the dynamic links within a pedagogical process. These links are needed for personalization of the process and self-regulation that leads to a learner's holistic development.

Teachers usually in classrooms and pedagogues in other social settings provide pedagogical provision by following the same pedagogical regularities; therefore, the science of pedagogy that underpins the practices of pedagogy should be considered common for teachers, pedagogues and other professionals in the sphere of organized education. Therefore, pedagogy as a university discipline can be found in programmes, for instance, of nurses and doctors. Practice of pedagogy is sensitive towards diversity and commonalities in human development; therefore, common theoretical assumptions and practical strategies are adjusted to the current needs of the learners, peculiarities of the situation and new possibilities, like those of IT, commonalities become individually different and manifest themselves in learner's activities. Therefore, four sub-systems of digitally mediated action (Blayone, 2018) are considered relevant:

a) Relating to building and maintaining human-machine pairings and meta-functional, technical and operational;

b) Mediating cultural expression addresses internalization and externalization largely determined by rules and values of participating communities;

c) Automatization of actions by reducing them to formal procedures (algorithms) run by a machine

d) The most complex sub-system addresses digitally-mediated collaboration. This novelty needs to be pedagogically equipped in its three capacities ñ theory, practice, university discipline by undergoing further transition from individualization of organized pedagogical processes to personalized ones.

Meanwhile, discrete notion of education sciences occupies a large area of human activities; and only pedagogy and educational management are developed in the capacity of science. Besides, the science of pedagogy (theory and practice of formal education) cannot be fully identified with the education sciences, since it can only be one of these; the term of education sciences is too often used in limited aspects and outside scientific contexts. For instance, the government's regulations mix up these two categories within one and the same document (Saeima, 2012). The government also points to the growing dominance of PISA as a powerful tool :

a) To initiate and justify the educational developments by comparing figures related to education;

b) To use its technical capacity for the national indicators for benchmarking and initiating further educational changes. Programme for International Student Assessment (PISA) and Organisation for Economic Co-operation and Development (OECD) projects are conducted in Latvia under the title of Education Sciences; these investigations are highly informative and seldom produce theories, at least by projects conducted in this country.

If compared to other fields of human activities, methods or strategies of pedagogy cannot be precisely repeated even in similar situations. This leads to the opinion that pedagogy is an art. In these cases understanding of theories and constant regularities are helpful. Multiple meanings and nuances of situation-dependent pedagogical actions, being based on complex knowledge, ceases when these no longer make sense to the learner and why interaction between learners and between learners and teachers stops. Teacher's action consists of the mediation between the proper configuration of subject content and the structured learning activities which the teacher has designed for the learners (Jank& Meyer, 1994, 81) leaving space for the learners' self-evaluation and autonomous choice. To conclude on the core features of pedagogy, D. Bellís' assumption seems to be very relevant: Typically, transformational pedagogy is seen to include the following features: action-oriented; inquiry-based and systems-based learning; integrated, holistic approaches; creative use of technology.

The following definitions reflect an understanding of science and practice of pedagogy and are suggested for discussion:

Pedagogy is an integrated humanistic and social science which investigates regularities of combined and unique, focused on the content of learning interactions, communication and mutual relations that occur in this process and constitute a specific research object. Pedagogical practice is mainly represented by organized pedagogical processes which are created on the background of pedagogical theories and specifically aim at achieving an educative goal. Realization of this deliberate goal occurs through internal, dynamic connections activated by targeted, organized, goal-oriented educational processes, which transform mankind's intellectual and cultural values into the meaningful educational, developmental and educative content to facilitate the acquisition of these values by participants of the process and to foster their personal development and self-actualization (Žogla, 2017).

Science of pedagogy constitutes teacher's philosophy-in-use (Hessens, 1929) and manifests itself in practice of pedagogy. Teachers like any other professionals have to cover their university discipline, and that is science and practice of pedagogy ñ the theoretical background for teachers' pedagogical thinking and creating their professional competence. The core functions of the university discipline usually represented by a cluster of study subjects are as follows :

a) To provide students with possibilities of creating teacher's strategic knowledge; understanding of the essence and development of humans lead to pedagogical regularities for appropriate integrating teaching, learning and the subject matter/ content and initiating a congruent pedagogical process towards the learners' engagement in the highest quality of learning together;

b) To develop students' ability of selecting appropriate pedagogical tools adopted by learners; these address and challenge the learners' diverse and developing needs in changing situations, growing amount of knowledge and possibilities provided by the digital environment;

c) To facilitate teacher's professional integrity and identity that manifest themselves in building relationships on the foundation of communication and collaboration with the learners by treating them as a whole developing person.

Pedagogy as a science, practice and discipline has been developed as a holistic, personalized system to assist learners or work with children, young and even elderly people (also called Andragogy) in formal and non-formal educational settings in the majority of European countries ñ Germany, Austria, Poland, Greece, Scandinavian countries etc. A pedagogue's ability of generalizing and adjusting interventions is popular also for enterprises: the science of pedagogy provides an overarching system that could bring greater coherence to educational services. It provides a framework for discussing and adopting aims, activities and evaluation of achievements for learners at any age as it deals with general constant regularities of a pedagogical process. Qualifications and degrees in pedagogy are popular due to its clear structure and system of theories being in non-stop research-based development; the graduates report their acceptance of pedagogy in European countries in different spheres where relations among people dominate as a value for their pedagogical skills that make them well equipped, flexible and stable workforce across a wide range of services, as well as governmental and non-governmental institutions (mentors for novices or refugees, nurses, trainers, couches etc.). Pedagogy has the potential for an inclusive, integrating and engaging approach due to its core functions and clear internal system of notions, which allows for coherent mutually related actions of teaching and learning based on communication, cooperation and mutual relations. Inner constant regularities of a pedagogical process provide congruence that is among the basic criteria for research, action-based and process-oriented educational provision; the background theories of humanities allow for value exchange.

2.6 Summary

In this Unit you have learnt :

● Pedagogical process is a deliberate process of intentional teaching and learning is a process for living (Dewey, 1963). Pedagogy is interdisciplinary, it functions as the theory or science and teachers' professional philosophy, academic discipline and practice, meets the general requirements to achieve educational, developmental and educative goals in their integrated quality; and these are in compliance with the integrity of human's physical, mental and social nature.

● Furthermore, pedagogy is impoverished if it is disconnected from the capacity and responsibility to engage in curriculum development and to deploy a range of appropriate assessment methodologies. Pedagogy is generally regarded as the 'art and science of teaching'. Pedagogy encompasses the psychological, cultural, political and socio-emotional processes of teaching young children, and is not to be confused with curriculum (Ryan & Hornbeck, 2007). Craft (2005), defines pedagogy 'as encompassing appropriate and defensible professional judgments about how teaching is undertaken and learning nurtured', implying that pedagogy requires a sound theoretical basis. Pedagogy is influenced by classroom and school contexts.

● Pedagogic expertise can be thought of as a combination of science, craft and art (see diagram); this notion helps us to understand the complementary needs for collectively created knowledge, professional skills and personal capacities. It is also important to remember that all these are grounded in ethical principles and moral commitment - teaching is never simply an instrumental activity, a question just of technique.

● Didaktik is a curriculum tradition guided by the philosophy of Bildung and the idea of educating instruction, erziehendeUnterricht, in educational institutions. In that tradition, the pedagogical relation between the teacher and students, the content relation of a teacher to the subject matter and the didactic relation of a teacher to students' learning are seen as core elements in the teaching-studying-learning process. The Didaktik curriculum tradition in which values and morals are emphasized in guiding the teaching-studying-learning process and in educating pupils as whole. This means that pedagogy is moral in nature, and the teacher's main task is to reflect the values underlying his / her teaching and the purposes she wants to advance in her teaching.

● **Scope of Pedagogy as Art of Teaching:**

A. Designing lessons unit
B. Teaching repertoire
C. Creating effective learners
D. Creating conditions for learning

● Science of Pedagogy indicates that learning and teaching as the central actions/ activities in pedagogy foster the learner's, as well as teacher's development by using the subject matter as a pedagogical tool, while teaching and learning being implemented in cooperation and communication open new possibilities for value and attitudinal exchange as an educative goal. Teachers, or even parents, can hardly influence the learners' views, values, and ideals in a direct way; rather the values coming from the external sphere can be facilitated and fostered through the learner's actions and

communication and by targeted and meaningful development of the learners' self-conducted action.

● Vygotsky's theories have been well-known since the 1930s and used to underpin the investigations towards understanding the practice and science of pedagogy. The theory of the zone of proximal development was especially productive for pedagogy as a teachers' philosophy-in-use: learning always precedes development and pulls along the learners' experience (Vygotsky, 1978). This concept highlights where the learner's autonomous learning slows down due to his/her limited possibilities and how assistance can speed it up, empowering further learning by addressing his/her experience, preserving its developmental and motivating value, and by doing so creating the dynamic links within a pedagogical process.

● In higher education, the core pedagogical functions supposed to ensure :

a) To provide students with possibilities of creating teacher's strategic knowledge; understanding of the essence and development of humans lead to pedagogical regularities for appropriate integrating teaching, learning and the subject matter/ content and initiating a congruent pedagogical process towards the learners' engagement in the highest quality of learning together;

b) To develop students' ability of selecting appropriate pedagogical tools adopted by learners; these address and challenge the learners' diverse and developing needs in changing situations, growing amount of knowledge and possibilities provided by the digital environment;

c) To facilitate teacher's professional integrity and identity that manifest themselves in building relationships on the foundation of communication and collaboration with the learners by treating them as a whole developing person.

2.7 Self-Assessment Questions

1. What are the theoretical assumptions of Dewy about Pedagogy as a social process?
2. Pedagogy is not mere teaching strategy it's much more than that- justify the statement.
3. Explain that Pedagogy is the artistry of teaching and learning.
4. Explain 'Didactical Triangle'.
5. Mention the steps of learning design preparation.
6. Briefly illustrate Vygotsky's idea about the art of teaching.
7. What is meant by Science of Pedagogy?

8. Briefly explain the core functions of a teacher in pedagogic practice.
9. Discuss the Scope of Pedagogy as Art of Teaching.
10. Justify that pedagogy is neither exclusively arts nor exclusively science rather it's a combination of both.

2.8 References

Blayone, T. (2018). Reexamining digital-learning readiness in higher education: Positioning digital competencies as key factors and a profile application as a readiness tool. International Journal on E-Learning, 17(4), 425-451.

Bodrova, E. and Leong, D. J. (1996). Tools of the Mind: The Vygotskian Approach to Early Childhood Education, New York: Merrill/Prentice Hall.

Brookfield, S. 2017. Becoming a Critically Reflective Teacher.San Francisco: Jossey-Bass.

Burnard, P, Craft, A, Cremin, T, Duffy, B, Hanson, R & Keene, J. (2006). 'Documenting 'possibility thinking': A journey of collaborative enquiry', International Journal of Early Years Education, 14(3), pp. 243-262.

Craft, A. (2005). Creativity in schools: Tensions and dilemmas. Psychology Press.

Dewey, J. (1963). Liberalism and social action (Vol. 74). New York: Capricorn books.

Early Childhood Education: An International Encyclopedia. Westport, CT: Praeger.

Egan, K. (2005). An Imaginative Approach to Teaching. Jossey-Bass, San Francisco, CAGallas (p. 460).

Egan, K., & Judson, G. (2009). Of whales and wonder. Engaging the Whole Child: Reflections on Best Practices in Learning, Teaching, and Leadership, 65(6), 20-25.

Eisner, E. W. (1983). The Art and Craft of Teaching. Educational Leadership, 40(4), 4-14.

Greene, M. (2001). Variations on a Blue Guitar. New York: Teachers College, Columbia University.

Gudjons, H. (1995). Educational background. 4th edit. (Published in German: Gudjons, H. P‰dagogischesGrundwissen. 4. Auflage.). Julius KlinghardtVerlag.

Immordino-Yang, M &Damasio, A. (2007). 'We feel, therefore we learn: The relevance of affective and social neuroscience to education', Mind, Brain & Education, vol. 1, no. 1, pp. 3-10

Immordino-Yang, M. H., & Fischer, K. W. (2007). Dynamic development of hemispheric biases in three cases: Cognitive/hemispheric cycles, music, and hemispherectomy. In D. Coch, K. W. Fischer & G. Dawson (Eds.), Human behavior, learning and the developing brain: Vol. 1. typical development (pp. 74 - 111). New York : Guilford.

Jank, W., & Meyer, H. (1994). Didactic Models. (Published in German: Jank, W., & Meyer, H. DidaktischeModelle.). Berlin: CornelsenVerlagScriptor GmbH & Co. KG.

Jeffrey, B., & Craft, A. (2003). Teaching creatively and teaching for creativity: distinctions and relationships. Educational studies, 30(1), 77-87.

Jenkins, R. (2015). The Four Properties of Powerful Teachers. Advice: The Chronicle of Higher Education.

KopeloviËa, A., &Zukovs, L. (2001). PedagoÏijaszin,tnespriek?metsunapak?nozares. [Object of pedagogy as a science and its sub-branches]. LatvijasZin,tÚuAkadÁmijasVÁstis [News of the Latvian Academy of Sciences], 55(1./2.), 17ñ19.Pollard (2010).

Lang, J. (2015). Waiting for Us to Notice Them. Advice: The Chronicle of Higher Education.

Leach, J., & Moon, B. (2008). The power of pedagogy. Sage.Hessens (1929)

Leontyev, A. N. (1977). "Activity and personality". In Philosophy in the USSR: Problems of Dialectical Materialism, 180-202. Moscow: Progress Publisher.

Lupton, M. (2013). Reclaiming the Art of Teaching. Teaching in Higher Education, 18(2), 156-166.

Petrie, P., Boddy, J., & Cameron, C. (2009). Working with Children in Care: European Perspectives: European Perspectives. McGraw-Hill Education (UK).

Pipere, A., Veisson, M., &Salite, I. (2015). Developing research in teacher education for sustainability: UN DESD via the Journal of Teacher Education for Sustainability. Journal of Teacher Education for Sustainability, 17(2), 5n43. https://doi.org/10.1515/jtes-20150009

Robinson, K., & Azzam, A. M. (2009). Why creativity now? Educational Leadership, 67(1), 22-26.

Robinson, K. (2006, February). Do schools kill creativity? [Video file]. TED Talks: Ideas Worth Spreading. Accesed on April 14, 2020, from www.ted.com/talks/lang/eng/ken_robinson_says_schools_kill_creativity.html

Ryan, S., Hornbeck, A. (2007). Pedagogy. In RS, New,M. Cochran, (Eds.),

Saeima. (2010). PaziÚojums par LatvijasilgtspÁjÓgasattÓstÓbasstratÁÏijaslÓdz 2030.

gadamapstiprin,?anu. [Sustainable development of Latvia till 2030]. Latvijas V Ástnesis, 101(4293), 29.06.2010. Accessed 12.12.2015.

Simpson, D, Jackson, M., and Aycock, J. (2005). John Dewey and the Art of Teaching: Toward Reflective and Imaginative Practice. Thousand Oaks, CA: Sage.

Smith, M., & Mathur, R. (2009). Children's imagination and fantasy: Implications for development, education, and classroom activities. Research in the Schools, 16(1), 52.

Sternberg, R. J. (2003). Wisdom, intelligence, and creativity synthesized. Cambridge University Press.

Tirri, K., & Toom, A. (2020). The moral role of pedagogy as the science and art of teaching. Pedagogy in basic and higher education: Current developments and challenges, 3-13.

Vygotsky, LS. (2004). 'Imagination and Creativity in Childhood', (ME Sharpe, Trans.), Journal of Russian and East European Psychology, 42 (1). pp. 7-97, (Original work published 1967)

Waring, M., & Evans, C. (2015). Understanding pedagogy: Developing a critical approach to teaching and learning. Routledge, London & New York.

Watkins, C., & Mortimore, P. (1999). Pedagogy: What do we know? In Mortimore, P. (Ed.), Understanding pedagogy and its impact on learning (pp. 1ñ19). London: Paul Chapman Publishing. Longhram (2010)

Woods, P. (1990) Teacher skills and strategies (London, Falmer).Cremin, Burnard and Craft (2006, p. 108)

Žogla, I. (1995). SkolaspedagoÏija. Skolot,js [School pedagogy. Teacher], 5, 8ñ10.

Žogla, I. (2017). PedagoÏija and educational sciences: Competing traditions in the study of education in Latvia. In Whitty, G., & Furlong, J. (Eds.). (2017). Knowledge and the study of education ñ an international exploration. Oxford Studies in Comparative Education. 27(1), 101ñ121. Symposium Books.

Žogla, I. (2018). Science of pedagogy: Theory of educational discipline and practice. Journal of Teacher Education for Sustainability, 20(2), 31-43.

Unit–3 : Teaching

Structure

3.1 Objectives

In this Unit, we have tried to introduce you to the basic concepts of Teaching. Apart from conceptual issues, the process of teaching is also being discussed with illustration with related factors and skills associated with teaching with examples. After the end of this unit you should be able to :

- Explain concepts and principles of teaching.
- Discuss teaching as a process with explanation and exemplification.
- Explain the distinct features of three different phases of Teaching.
- Justify the relevance of 3R issues in teaching.
- Explain verbal conditioning as a factor of teaching.
- Give reason how psychomotor skills can influence the process of teaching.

3.2 Introduction

In this unit of course structure, the core concept of Teaching is being discussed. Teaching is a complex process, hence the need to understand it as a sequential step by step authentic series of activities designed by the teacher. As it has already been mentioned in the previous unit that teaching is a performing arts. And such performing arts follow a particular pattern of action guided by certain principles. Hence teaching is a process result of which is reflected in terms of the learning outcome of the learner. We will introduce you to the concept, principles and function of teaching as well as three different phases of teaching-respectively Pre-active, Interactive and Post-active. You will also be exposed to the concept of 3Rs and verbal conditioning and psychomotor skills as factors associated with teaching.

3.3 Teaching : Concepts, Principles and Functions

3.3.1. Concepts of Teaching

Teaching as a concept is quite ambiguous and complex. There are several meanings attached to this concept traditionally. Researchers on teaching have recently advanced their own definitions of the term while philosophers of education and educational psychologists have emphasized quite different theoretical orientations from time to time. A non-professional interprets teaching to be a kind of coaching done systematically at a particular place at a particular time and through the agency of an appointed person.

In much modern usage, the words 'teaching' and 'teacher' are wrapped up with schooling and schools. One way of approaching the question 'What is teaching?' is to look at what those called 'teachers' do - and then to draw out key qualities or activities that set them apart from others. The problem is that all sorts of things are bundled together in job descriptions or roles that may have little to do with what we can sensibly call teaching.

Another way is to head for dictionaries and search for both the historical meanings of the term and how it is used in everyday language. This brings us to definitions like: Impart knowledge to or instruct (someone) as to how to do something; or Cause (someone) to learn or understand something by example or experience.

As can be seen from these definitions we can say that we are all teachers in some way at some time. Further insight is offered by looking at the ancestries of the words. For example, the origin of the word 'teach' lies in the Old English tæcan meaning 'show, present, point out', which is of Germanic origin; and related to 'token', from an Indo-European root shared by Greek deiknumi 'show', deigma 'sample'.

Lexicographers define teaching as imparting knowledge or skills, giving instructions or lesson, inspiring, assisting another to learn, providing information of appropriate situations, conditions or activities designed to facilitate learning

Flanders (1970) explains teaching as a transactional activity between the teacher and taught .He says that teaching behavior by its very nature exists in the context of social interaction. The act of teaching leads to reciprocal contacts between the teacher and the learners and the interchange itself is called teaching.

Ronald T. Hyman observes that teaching involves a triad of elements (the teacher, the learner, the subject matter) and this triad is dynamic in quality. He rightly asserts that the nature of teaching cannot be understood properly by looking at only one or two of the elements of the teaching relationships or by thinking of teaching as dyadic. Thus, all the three elements must be considered together in order to understand the interaction recurring during teaching. In this frame of reference, a teacher needs not only to be aware of his aim of teaching but also of his relationship with his learners and the subject matter and the learner's relationship with the subject matter. Also, it prevents the teacher from trying to teach the 'syllabus' as handed out by the department as it constitutes a static and not a dynamic relationship between teacher and subject matter.

B. F. Skinner (1968) defines teaching as 'the arrangement of contingencies of reinforcement'. **K. Mitra** in his national lecture at the Center of Advanced Study in Education, defined teaching 'as a series of acts carried out by a teacher and guided by the formulation of teaching tasks in a formalized instructional situation'.

The aforementioned definitions of teaching bring out the following qualities about concept of teaching :

1. Teaching is a system of activities. In other words, it is a number of logically contrived sets of activities having a specific structure, form and orientation.
2. Teaching aims at changing others or causing learning in others. Without a suitable goal or objective, no worthwhile teaching can be arranged.
3. The core of the teaching act is increment between teacher, learners, and subject matter. Thus it is by its very nature a social enterprise involving dynamic interaction among a triad.
4. Teaching involves an influence orientation where the direction of focus of control is from the teacher to the learner.
5. Teaching does not just occur, rather it is a planned and an implemented set of activities in an interactional setting in terms of the prior thought about the learning goals, instructional strategies and the subject matter configuration.

6. As it is practiced, teaching implies an 'intentional' rather than 'success' act. In other words, when a teacher engages in the act of teaching, his intention is to cause learning but he may or may not succeed in the achievement of this goal. It is for this reason that we often debate the 'effectiveness' of teaching from one situation to the other.
7. The verbal action and use of language at various levels constitutes the predominant feature of teaching in any context. The analysis of teaching acts is therefore, quite frequently conducted with the help of data collected from the verbal behaviour of teachers. It may, however, be useful to remember that both verbal and non-verbal parts of teaching behaviour occur simultaneously and function in close juxtaposition to each other in order to accomplish the necessary effect.

The critical attribute of teaching involves 'reasoning' and 'an enlightened analysis of facts'. It is not concerned with bare listing or relaying of facts in a mechanical fashion. The entire teaching act can be explained in terms of three definite phases within it - the introductory or orientation phase; the development and fixation phase; and the evaluation phase. The introductory or orientation phase involves the presentation of the new information and concept or behaviour. The development and fixation phase implies their establishment in the repertoire of the learner and the evaluation phase indicates the point where the designer of the instructional system checks the extent of learning having occurred. The teaching act by itself can also be prefixed and suffixed with two different stages. The prefix is now given a name of 'pre active' stage and the suffix is called the 'post active' stage of teaching. In the pre active stage, the goals of teaching are decided, the content of presentation is identified and the strategies and tactics for interaction setting are planned. In the post active stage of teaching, the events of the interactive stage are analyzed in retrospect and decisions for further interaction in a face to face set up are taken. The interactive stage is the actual teaching conducted by the teacher when he is before his learners. The understanding of above qualities of teaching would remain useful to understand the models of teaching, the frame of this investigation.

3.3.2. Principles of Teaching :

What one person sees as good teaching can easily be seen as bad by another. Here we are going to look at what the Ofsted (2015) framework for inspection says. However, before we go there it is worth going back to what Paul Hirst argued back in 1975 and how we are defining teaching here. Our definition was:

Teaching is the process of attending to people's needs, experiences and feelings, and making specific interventions to help them learn particular things.

We are looking at teaching as a specific process - part of what we do as educators, animators and pedagogues. Ofsted is looking at something rather different. They are grouping together teaching, learning and assessment - and adding in some other things around the sort of outcomes they want to see. That said, it is well worth looking at this list as the thinking behind it does impact a lot of the work we do. a judgment ma-might be made with specific frame work of rubric on the effectiveness of teaching, learning and assessment by evaluating the extent to which:

Teachers, practitioners and other staff have consistently high expectations of what each child or learner can achieve, including the most able and the most disadvantaged

Teachers, practitioners and other staff have a secure understanding of the age group they are working with and have relevant subject knowledge that is detailed and communicated well to children and learners

Assessment information is gathered from looking at what children and learners already know, understand and can do and is informed by their parents/previous providers as appropriate Assessment information is used to plan appropriate teaching and learning strategies, including to identify children and learners who are falling behind in their learning or who need additional support, enabling children and learners to make good progress and achieve well

Except in the case of the very young, children and learners understand how to improve as a result of useful feedback from staff and, where relevant, parents, caregivers and employers understand how learners should improve and how they can contribute to this

Engagement with parents, caregivers and employers helps them to understand how children and learners are doing in relation to the standards expected and what they need to do to improve. Equality of opportunity and recognition of diversity are promoted through teaching and learning. Where relevant, English, mathematics and other skills necessary to function as an economically active member of British society and globally are promoted through teaching and learning.

We see some things that many will not disagree with like having high expectations of learners, knowing what the needs of the group may be, having expertise in the area being taught; recognizing diversity and having a concern for equality of opportunity; and so on. We may also see the role that assessment plays in reinforcing learning and helping to shape future learning. However, there are things we may disagree with. Perhaps more importantly there are all sorts of things missing here. For example, why is there an emphasis on economic activity as against social, religious and political participation? Another issue, for many of you reading this, is possibly the way in which little account is made of the extent to which learners take responsibility for their own learning. They are encouraged to contribute to learning but not own it.

Good teaching is rather more than technique according to Parker J. Palmer. Good teaching, he says, 'comes from the identity and integrity of the teacher' (Palmer 1998). It is the way we are experienced, our enthusiasm, our care, our knowledge, our interest in, and concern for, people that is the key to whether we are felt to be good teachers. As Beere (2012) and others have argued we need to be present as people in the classroom or learning environment.

This is not to say that technique isn't important. It is. We need to be skilled at scaffolding learning; creating relationships and environments for learning; and catching teaching moments. It is just that these skills need to be employed by someone who can be respected, is experienced as real and is wise.

Therefore, principles of teaching can be summarized as follows :

- Principle of using previous knowledge
- Principle of providing for individual difference
- Principle of readiness
- Principle of meaningfulness
- Principle of defining specific objectives of the lesson
- Principle of proceeding from simple to complex
- Principle of proceeding from concrete to abstract
- Principle of proceeding from general to specific
- Principle of proceeding from known to unknown

Guiding Principles in the Selection and Use of Teaching Strategies :

The more senses that are involved in learning, the more and the better the learning.

Approaching teaching as a process

Some of the teaching we do can be planned in advance because the people involved know that they will be attending a session, event or lesson where learning particular skills, topics or feelings is the focus. Some teaching arises as a response to a question, issue or situation. However, both are dependent on us:

- Recognizing and cultivating teachable moments.
- Cultivating relationships for learning.
- Scaffolding learning - providing people with temporary support so that they deepen and develop their understanding and skills and grow as independent learners.
- Differentiating learning - adjusting the way we teach and approach subjects so that we can meet the needs of diverse learners.

- Accessing resources for learning. Adopting a growth mindset.
- Adopting a growth mindset.

3.3.3. Functions of Teaching:

The very core purpose of Teaching is Fostering learning.To make sense of this it is worth turning to what philosophers of education say. Interestingly, the question, 'What is teaching?' hasn't been a hotbed of activity in recent years in the UK and USA. This says something about the state of schooling and of university departments of education in these countries. A lot of attention has been given to what is good, great or effective 'teaching', and not much to what actually teaching is. However, as Paul Hirst (1975) concluded, 'being clear about what teaching matters vitally because how teachers understand teaching very much affects what they actually do in the classroom'.

Hirst (1975) makes two very important points. For him teaching should involve:

a. Setting out with the intention of someone learning something.
b. Considering people's feelings, experiences and needs. Teaching is only teaching if people can take on what is taught.

We can begin to weave these into a definition - and highlight some forms it takes. Teaching is the process of attending to people's needs, experiences and feelings, and making specific interventions to help them learn particular things. Interventions commonly take the form of questioning, listening, giving information, explaining some phenomenon, demonstrating a skill or process, testing understanding and capacity, and facilitating learning activities (such as note taking, discussion, assignment writing, simulations and practice).

Let us look at the key elements :

1. Attending to people's feelings, experiences and needs

Considering what those we are supposed to be teaching need, and what might be going on for them, is one of the main things that makes 'education' different from indoctrination. Indoctrination involves knowingly encouraging people to believe something regardless of the evidence (Snook, 1972). It also entails a lack of respect for their human rights. Education can be described as the 'wise, hopeful and respectful cultivation of learning undertaken in the belief that all should have the chance to share in life' (Smith 2015). The process of education flows from a basic orientation of respect - respect for truth, others and themselves, and the world (op. cit.). For teachers to be educators they must, therefore: Take into account people's needs and wishes now and in the future. Consider what might be good for all and the world in which we live.

2. Plan their interventions accordingly.

There are a couple of issues that immediately arise from this. First, how do we balance individual needs and wishes against what might be good for others? For most of us this is probably something that we should answer on a case-by-case basis - and it is also something that is likely to be a focus for conversation and reflection in our work with people. Second, what do we do when people do not see the point of learning particular things - for example, around grammar or safety requirements? The obvious response to this question is that we have to ask and listen - they may have a point. However, we also have to weigh this against what we know about the significance of these things in life, and any curriculum or health and safety or other requirements we have a duty to meet. In this case we have a responsibility to try to introduce them to people when the time is right, to explore their relevance and to encourage participation.

Failing to attend to people's feelings and experiences is problematic - and not just because it reveals a basic lack of respect for them. It is also pointless and counter-productive to try to explore things when people are not ready to look at them. We need to consider their feelings and look to their experiences - both in our classroom or teaching environment, and around the issues or areas we want to explore. Recent developments in brain science has underlined the significance of learning from experience from the time in the womb (Lieberman 2013). Bringing people's experiences around the subjects or areas we are looking to teach about into the classroom or learning situation is, thus, important to the learning process.

3. Facilitating Learning particular things

Three elements are emphasized - focus, knowledge and engaging people in learning.

Focus. This may be a bit obvious - but it is probably worth saying - teaching has to have a focus. We should be clear about what we are trying to do. One of the findings that shines through research on teaching is that clear learning intentions help learners to see the point of a session or intervention, keep the process on track, and, when challenging, make a difference in what people learn (Hattie 2009).

As educators, pedagogues and workers there are a lot of times when we are seeking to foster learning but there may not be great clarity about the specific goals of that learning (Jeffs and Smith. 2016). We journey with people, trying to build environments for learning and change, and, from time-to-time, creating teaching moments. It is in the teaching moments that we usually need an explicit focus.

Subject knowledge. Equally obvious, is that we need expertise, we need to have content. As coaches we should know about our sport; as religious educators about belief, practice and teachings; and, as pedagogues, ethics, human growth and

development and social life. It is clear that good teachers 'have deep knowledge of the subjects they teach, and when teachers' knowledge falls below a certain level it is a significant impediment to students' learning' (Coe et. al. 2014).

That said, there are often times when we develop our understanding and capacities as we go. In the process of preparing for a session or lesson or group, we may read, listen to and watch YouTube items, look at other resources and learn. We build content and expertise as we teach. Luckily, we can draw on a range of things to support us in our efforts - video clips, web resources, textbooks, activities. Yes, it might be nice to be experts in all the areas we have to teach - but we can't be. It is inevitable that we will be called to teach in areas where we have limited knowledge. One of the fascinating and comforting things research shows is that what appears to count most for learning is our ability as educators and pedagogues. A good understanding of a subject area, good resources to draw upon and the capacity to engage people in learning yields good results. It is difficult to find evidence that great expertise in the subject matter makes a significant difference within a lot of schooling (Hattie 2009).

Having a concern for learning - and in particular seeking to create environments where people develop as, and can be self-directed learners - is one of the key features here. Sometimes subject expertise can get in the way - it can serve to emphasize the gap between people's knowledge and capacities and that of the teacher. On the other hand, it can be used to generate enthusiasm and interest; to make links; and inform decisions about what to teach and when.

Engaging people in learning. All this underlines our last key point - at the center of teaching lies enthusiasm and a commitment to, and expertise in, the process of engaging people in learning. This is how John Hattie (2009) put it: "It is teachers using particular teaching methods, teachers with high expectations for all students, and teachers who have created positive student-teacher relationships that are more likely to have the above average effects on student achievement".

4. Making specific interventions

The final element - making specific interventions - concerns the process of taking defined and targeted action in a situation. In other words, as well as having a clear focus, we try to work in ways that facilitate that focus. Thinking about teaching as a process of making specific interventions is helpful, I think, because it:

o Focuses on the different actions we take. As we saw in the definition, interventions commonly take the form of questioning, listening, giving information, explaining some phenomenon, demonstrating a skill or process, testing understanding and capacity, and facilitating learning activities (such as note taking, discussion, assignment writing, simulations and practice).

- Makes us look at how we move from one way of working or communicating to another. Interventions often involve shifting a conversation or discussion onto a different track or changing the process or activity. It may well be accompanied by a change in mood and pace (e.g. moving from something that is quite relaxed into a period of more intense activity). The process of moving from one way of working - or way of communicating - to another is far from straightforward. It calls upon us to develop and deepen our practice.
- Highlights the more formal character of teaching. Interventions are planned, focused and tied to particular objectives or intentions. Teaching also often entails using quizzes and tests to see whether planned outcomes have been met. The feel and character of teaching moments are different to many other processes that informal educators, pedagogues and specialist educators use. Those processes, like conversation, playing a game and walking with people are usually more free-flowing and unpredictable.

Teaching, however, is not a simple step-by-step process e.g. of attending, getting information and intervening. We may well start with an intervention which then provides us with data. In addition, things rarely go as planned - at least not if we attend to people's feelings, experiences and needs. In addition, learners might not always get the points straightaway or see what we are trying to help them learn. They may be able to take on what is being taught - but it might take time. As a result, how well we have done is often unlikely to show up in the results of any tests or in assessments made in the session or lesson.

Teachers certainly those in most formal settings like schools - have to follow a curriculum. They have to teach specified areas in a particular sequence. As a result, there are always going to be individuals who are not ready for that learning. As teachers in these situations we need to look out for moments when students may be open to learning about different things; where we can, in the language of Quakers, 'speak to their condition'. Having a sense of their needs and capacities we can respond with the right things at the right time.

Informal educators, animators and pedagogues work differently for a lot of the time. The direction they take is often not set by a syllabus or curriculum. Instead, they listen for, and observe what might be going on for the people they are working with. They have an idea of what might make for well-being and development and can apply it to the experiences and situations that are being revealed. They look out for moments when they can intervene to highlight an issue, give information, and encourage reflection and learning. Considering teaching as 'process based approach', Teaching may have further following functions :

A. Recognizing and cultivating teachable moments :

In other words, all teaching involves recognizing and cultivating 'learning moments' or 'teaching moments'. It was Robert J Havinghurst who coined the term 'teachable moment'. One of his interests as an educationalist was the way in which certain things have to be learned in order for people to develop.

When the timing is right, the ability to learn a particular task will be possible. This is referred to as a 'teachable moment'. It is important to keep in mind that unless the time is right, learning will not occur. Hence, it is important to repeat important points whenever possible so that when a student's teachable moment occurs, s/he can benefit from the knowledge. (Havinghurst 1953)

There are times of special sensitivity when learning is possible. We have to look out for them, to help create environments that can create or stimulate such moments, be ready to respond, and draw on the right resources.

B. Cultivating collaborative relationships for learning :

The main thing here is that teaching, like other parts of our work, is about relationships. We have to think about our relationships with those we are supposed to be teaching and about the relationships they have with each other. Creating an environment where people can work with each other, cooperate and learn is essential. One of the things that has been confirmed by recent research in neuroscience is that 'our brains are wired to connect', we are wired to be social (Lieberman 2013). It is not surprising then, that on the whole cooperative learning is more effective than either competitive learning where students compete to meet a goal or individualistic learning (Hattie 2011).

As teachers, we need to be appreciated as someone who can draw out learning; cares about what people are feeling, experiencing and need; and breathes life to situations. This entails what Carl Rogers, Kirschenbaum and Henderson 1990 talked about as the core conditions or personal qualities that allow us to facilitate learning in others :

- **Realness or genuineness**. Rogers argued that when we are experienced as real people-entering into relationships with learners 'without presenting a front or a façade', we are more likely to be effective.

- Prizing, acceptance, trust. This involves caring for learners, but in a non-possessive way and recognizing they have worth in their own right. It entails trusting in the capacity of others to learn, make judgements and change.

- Empathic understanding. 'When the teacher has the ability to understand the student's reactions from the inside, has a sensitive awareness of the way the process

of education and learning seems to the student, then again the likelihood of significant learning is increased'.

In practical terms this means we talk to people, not at them. We listen. We seek to connect and understand. We trust in their capacity to learn and change. We know that how we say things is often more important than what we say.

C. Scaffolding :

Scaffolding entails providing people with temporary support so that they deepen and develop their understanding and skills - and develop as independent learners.

Like physical scaffolding, the supportive strategies are incrementally removed when they are no longer needed, and the teacher gradually shifts more responsibility over the learning process to the student.

To do this well, educators and workers need to be doing what we have explored above - cultivating collaborative relationships for learning, and building on what people know and do and then working just beyond it. The term used for latter of these is taken from the work of Lev Vygotsky - is working in the learner's zone of proximal development.

A third key aspect of scaffolding is that the support around the particular subject or skill is gradually removed as people develop their expertise and commitment to learning.

Scaffolding can take different forms. It might simply involve 'showing learners what to do while talking them through the activity and linking new learning to old through questions, resources, activities and language' (Zwozdiak-Myers et al., 2013). The educational use of the term 'scaffolding' is linked to the work of Jerome Bruner -who believed that children (and adults) were active learners. They constructed their own knowledge. Scaffolding was originally used to describe how pedagogues interacted with pre-school children in a nursery (Woods et. al. 1976). Bruner defined scaffolding as 'the steps taken to reduce the degrees of freedom in carrying out some task so that the child can concentrate on the difficult skill she is in the process of acquiring' (Bruner 1978).

D. Differentiation :

Differentiation involves adjusting the way we teach and approach subjects so that we can meet the needs of diverse learners. It entails changing content, processes and products so that people can better understand what is being taught and develop appropriate skills and the capacity to act.

The basic idea is that the primary educational objectives-making sure all students master essential knowledge, concepts, and skills-remain the same for every student,

but teachers may use different instructional methods to help students meet those expectations. It is often used when working with groups that have within them people with different needs and starting knowledge and skills.

E. Accessing resources for learning

One of the key elements we require is the ability to access and make available resources for learning. The two obvious and central resources we have are our own knowledge, feelings and skills; and those of the people we are working with. Harnessing the experience, knowledge and feelings of learners is usually a good starting point. It focuses attention on the issue or subject; shares material; and can encourage joint working. When it is an area that we need to respond to immediately, it can also give us a little space to gather our thoughts and access the material we need.

The third key resource is the internet - which we can either make a whole group activity by using search via a whiteboard or screen, or an individual or small group activity via phones and other devices. One of the good things about this is that it also gives us an opportunity not just to reflect on the subject of the search but also on the process. We can examine, for example, the validity of the source or the terms we are using to search for something. The fourth great resource is activities. Teachers need to build up a repertoire of different activities that can be used to explore issues and areas. Last, and certainly not least, there are the standard classroom resources - textbooks, handouts and study materials.

As teachers we need to have a range of resources at our fingertips. This can be as simple as carrying around a file of activities, leaflets and handouts or having materials, relevant sites and e-books on our phones and devices.

F. Adopting a growth mindset

Last, we need to encourage people to adopt what Carol Dweck (2012) calls a growth mindset. Through researching the characteristics of children who succeed in education (and more generally flourish in life), Dweck found that some people have a fixed mindset and some a growth mindset.

Believing that your qualities are carved in stone, the fixed mindset creates an urgency to prove yourself over and over. If you have only a certain amount of intelligence, a certain personality, and a certain moral character, then you'd better prove that you have a healthy dose of them. It simply wouldn't look or feel deficient in these most basic characteristics.

There's another mindset in which these traits are not simply a hand you're dealt and have to live with, always trying to convince yourself and others that you have a royal flush when you're secretly worried it's a pair of tens. In this mindset, the hand you're dealt is just the starting point for development. This growth mindset is based on the

belief that your basic qualities are things you can cultivate through your efforts. Although people may differ in every way-in their initial talents and aptitudes, interests, or temperaments-everyone can change and grow through application and experience. (Dweck 2012). The fixed mindset is concerned with outcomes and performance; the growth mindset involves getting better at the task.

In her research she found, for example, that students with a fixed mindset when making the transition from elementary school to junior high in the United States, declined - their grades immediately dropped and over the next two years continued to decline. Students with a growth mindset showed an increase in their grades. The significance of this for teaching is profound. Praising and valuing achievement tends to strengthen the fixed mindset; praising and valuing effort helps to strengthen a growth mindset.

While it is possible to question elements of Dweck's research and the either/or way in which prescriptions are presented, there is particular merit when teaching of adopting a growth mindset (and encouraging it in others). It looks to change and develop rather than proving ourselves.

Structuring interventions and making use of different methods

One of the key things that research into the processes of teaching and educating tells us is that learners tend to like structure; they want to know the shape of a session or intervention and what it is about. They also seem to like variety, and changes in the pace of the work (e.g. moving from something quite intense to something free flowing).

It is also worth going back to the dictionary definitions - and the origins of the word 'teach'. What we find here are some hints of what Geoff Petty (2009) has talked about as 'teacher-centered' methods (as against active methods and student-centered methods).

Teacher-centered methods	**Active methods**	**Student-centered methods**
Talking	Supervised student practice	Reading for learning
Explaining	Discussion	Private study and homework
Showing	Group work	Assignments and essays
Questioning	Games	Projects and reports
Note-making	Role play, drama and simulations	Independent learning
	Seminars	Self-directed learning

If we ask learners about their experiences and judgements, one of things that comes strongly through the research in this area is that students overwhelmingly prefer group discussion, games and simulations and activities like drama, artwork and experiments. At the bottom of this list come analysis, theories, essays and lectures. However, there is not necessarily a connection between what people enjoy doing and what produces learning.

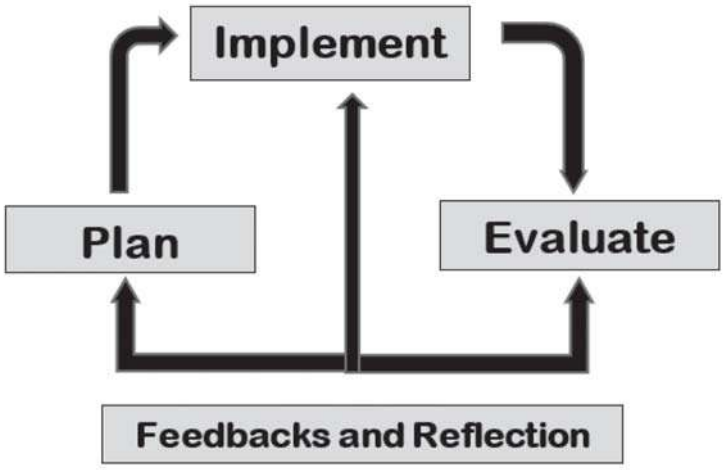
Schoolteachers may use all of these methods - but so might sports workers and instructors, youth ministers, community development workers and social pedagogues. Unlike school teachers, informal educators like these are not having to follow a curriculum for much of their time, nor teach content to pass exams. As such they are able to think more holistically and to think of themselves as facilitators of learning. This means:

Focusing on the active methods in the central column; Caring about people's needs, experiences and feeling; Looking for teachable moments when then can make inputs often along the lines of the first column (teacher-centered methods); and Encouraging people to learn for themselves i.e. take on projects, to read and study, and to learn independently and be self-directed (student-centered methods).

Reflection and Feedback in Teaching :

A major way that teachers improve their decision making is through reflection. Reflective teachers are thoughtful, analytical, and even self-critical about their teaching. After you have taught a lesson, you will want to reconsider your planning and the decisions you have made. Reflection, whether written or mental, is an effective tool for refining professional thoughts, ideas, and beliefs. Reflection enables us to evaluate our experiences, learn from mistakes, repeat successes, and revise and plan for the future.

Reflective teaching is complex and multifaceted. It is a review of one's practices in an attempt to determine whether you accomplished what you set out to do and to gain insight on more effective ways of doing what you did. A reflective teacher willingly takes responsibility for considering personal actions; is committed to thinking through difficult issues in depth, persistently seeking more knowledge and better ways to teach and to manage classrooms; maintains a healthy skepticism about educational theories and practices; and gathers as much information as possible about any given problem, weighs the value of the evidence against suitable criteria, and then draws a conclusion and makes a judgment (Ely, 1994).



TEACHING AS A PROCESS

Basically, reflection asks, how effective were the decisions I made? Specifically, reflection tries to answer questions such as the following :

- how appropriate were the topics-that is, should they be taught again?
- was the sequence of topics appropriate? If not, how should they be re-sequenced?
- was my goal(s) appropriate for my students?
- was my instruction aligned? Did my lesson plans facilitate my unit plan? Were the procedures and assessments I specified consistent with my goals?
- were the procedures I used as effective as they might have been? If not, what procedures might have been better?
- did the materials I used adequately represent the topic?
- what representations or resources would have made the topic more understandable?
- is there a way I could have made the overall environment more conducive to learning?

Finally, much of what has been said to this point refers to reflection as a process of questioning our practice in a variety of rational ways, but reflection can also be viewed as creative problem solving. Being creative fosters the teachers' need to know or be sure they demonstrate in their teaching sensitivity to what will be most beneficial for their students.

A growing body of research shows that experienced teachers reflect on many different dimensions of their lessons and can identify erroneous assumptions and

aspects of their teaching that can be improved (Berliner, 1994). Engaging in reflective thinking about teaching promotes a more thoughtful approach to planning, implementing, and assessing and potentially furthering the achievement of their students.

Here we have made a plea to explore teaching as a process rather than something that is usually approached as the thinking and activity associated with a particular role - the school teacher. As has been argued elsewhere a significant amount of what those called school teachers do is difficult to classify as education. Even the most informal of educators will find themselves teaching. They may well work hard at building and facilitating environments where people can explore, relate and learn. However, extending or deepening that exploration often leads to short or not so short bursts of teaching or instructing. For example, as sports coaches or outdoor educators we may be both trying to develop teamwork and build particular skills or capacities. As a specialist or religious educator we might be seeking to give information, or introduce ideas that need some explanation. These involve moments of teaching or instructing. Once we accept this then we can hopefully begin to recognize that school teachers have a lot to learn from other teachers - and vice versa.

We also need to unhook 'pedagogy' from school teaching within English language discussions - and to connect it with the tradition of didactics. One of the problems with the false link of school teaching to pedagogy is that it is impairing a proper discussion of pedagogy. However, that may change a little in the UK at least with the development of professional standards for social pedagogy and the emergence of graduate and post-graduate study in the area.

3.4 Teaching as a Process: Pre-active, Interactive and Post-active

We already understand from the above discussion of functions of teaching that teaching is a complex task. Therefore, effective teaching is

- One that is well planned & where activities are interrelated to each other
- Goes beyond recall of information
- One that provide learning experiences or situation that will ensure understanding, application and critical thinking
- One where the learner is stimulated to think and reason and apply

Hence, we need to have systematic planning to perform this task. Teaching has to be done in steps. The different steps constituting the process are called the phases of teaching. Each phase has some operations of teaching which create the situation for learning. Teaching process can be divided into three phases/stages.

1. Pre-active phase - refers to planning
2. Interactive phase - refers to the conduct and management
3. Post-active phase - refers to the follow-up and consolidation

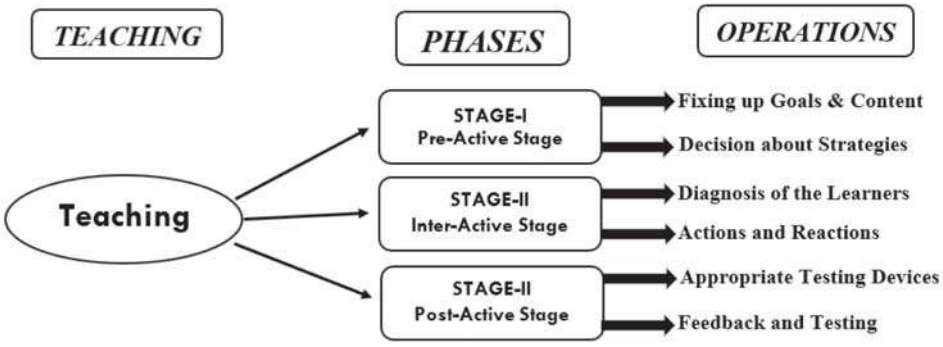


Fig: Different phases involve different operations of teaching.

3.4.1. The pre-active phase of teaching :

The pre-active stage begins from the point of time when the teacher decides to teach a particular item to a particular group of students and ends when the teacher is face to face with his students. Philip. W. Jackson observes that 'behaviour relevant to the teaching task in this pre active stage includes many things, such as preparing lesson plans, arranging furniture and equipment within the room, studying test reports, reading sections of a textbook, and thinking about the aberrant behaviour of a particular student. Formulating objectives, identifying the important ingredients of the contexts, specifying entry behaviour of the learners, listing the available resources for learning, developing a criterion test, and writing a teaching unit or a lesson plan are significant operations in the pre active stage of teaching. K. P. Pandey (1997) says, "there are three types of statements of objectives: general, specific and behavioural". The general objectives are quite abstract and are derived from the social philosophy of the country, the psychology of learning and the nature of the content. These statements are made specific by reference to the specific learning outcomes to be achieved after the presentation of instructional situations. Without mentioning the specific objectives, no efficiency in the system of instruction can be vouched. For writing behavioral objectives Mager (1962) and Gronlund (1971) prescribed the observance of the following three step contingency :

1. Identifying the terminal or end behaviour by name. This will require specifying the kind of behaviour that will be accepted as evidence that the learner has achieved the objective.
2. Defining the desired behaviour further by describing the important conditions under which the behaviour will be expected to occur.
3. Specifying the criteria of acceptable performance by describing how well the learner must perform to be considered acceptable.

The use of taxonomic principal categories - cognitive, affective and psychomotor domains is also found useful in indicating the goals for designing effective teaching-learning programmes. The taxonomy of educational objectives (BIoom,1956) consists of a set of general and specific categories that encompass all possible learning outcomes that might be expected from instruction. The objectives are of great use for curriculum development, teaching and testing. The cognitive domain refers to those objectives that emphasize intellectual outcomes such as knowledge, understanding and thinking skills. The affective domain deals with those objectives that lay stress on feeling and emotions such as interests, attitudes, appreciation and methods of adjustment. The psychomotor domain includes those objectives that emphasize motor skills such as handwriting, typing, swimming and operating machinery. Writing a teaching unit or lesson plan is also an important activity in the pre-active stage of teaching. Therefore,

a. It is the phase of planning for teaching.
b. Good planning makes the task of the teacher smooth, functional and successful.
c. There one two major steps involved in this phase.
   - Establish some kind of goals or objectives.
   - Discovering ways and means to activate these objectives.

Operation of teaching at pre-active phase

Before classroom teaching, a teacher has to perform many tasks. This phase includes all these activities which a teacher performs before entering the classroom. This stage involves the following activities.

(1) The formulation or fixing up of goal :

- The teacher formulates in detail the instructional objectives in behavioral terms by using the taxonomy of educational objectives.
- Objectives one determined according to the student's psychology and needs of the society and the school.
- Objectives are determined according to what changes the teacher expects in students by achieving these objectives.

(2) Selection of content or subject matter to be taught :

- After fixation of teaching objectives the teacher decides about the content to be presented before learners.
- For content selection following points should be kept in mind.
  a. The demand of syllabus/curriculum.
  b. The entry behavior of the accepted learners.
  c. Level of the motivation of learners.
  d. Teacher's preference for assessment related to the content.

(3) The arrangement of ideas and style of teaching: After selecting the presentable content, the teacher arranges the elements of the content in a logical and psychological sequence. Sequencing should be able to assist in the transfer of learning.

(4) Selecting Intuitional Methodology: The teacher has to select appropriate strategies and tactics of teaching, keeping in view the content and objectives of teaching. This operation is very important in the teacher-education programme.

(5) Development of teaching strategies: The teacher should decide beforehand about strategies and tricks, which he has to use during the course of his classroom teaching. He should decide about-

- When and what device of teaching should be used.
- When the teaching aids will be used.
- When recapitulation or evaluation etc. will be done.

(6) Deciding the duration, place, and management of classroom teaching.

(7) A decision about evaluation tools and techniques.

So, this stage is about working out the details of the teaching or activities a teacher wants to perform in the class. Here the teacher hypothesizes about the possible outcome of his action.

3.4.2. The interactive phase of teaching :

The actual implementation phase of the planned instructional system is the Interactive stage. It arises from face to face encounters in a social situation in which the teacher communicates knowledge, information or skill to the pupils with references to a subject matter. The nature of interaction between these three elements are highly dynamic in quality and this aspect of teaching is normally emphasized in empirical studies. It is so crucial that without interaction, no teaching could be said to have occurred. The verbal as well as non-verbal behaviours of teacher and pupils are involved in this process. It may be undertaken at the cognitive, social and performance

levels. For the interaction at cognitive domain, the linguistic behaviour i.e. use of language serves as a powerful vehicle. For the interaction in the social domain, the mutual relationship of acceptance, rejection and neutrality between the teacher, and pupil is important. In the performance domain, the mobility and actions of the teacher and pupils in response or reaction to directions, requests and commands assume significance. In the nonverbal behaviour, the gestures, gesticulation, and facial expressions involving the movement of eyes, lips etc. play a dominant role. Both verbal and nonverbal behaviour get expressed con-committedly and function in complementation to each other. During the interaction phase, presenting, asking, responding, reading, structuring, evaluating, and providing feedback are some of the specific operations.

This phase refers to the execution of the plan made during the pre-active phase. This is actual classroom teaching. In this phase, the teacher gives students the learning experiences through some suitable modes. In this phase, teachers give learners a predetermined environment. The teacher interacts with students so that desired changes can be brought in the learner.

So learning is directed in predetermined directions to achieve predetermined goals. In this process, the teacher provides learners with verbal stimulation. This stimulation can be of various kinds. Few examples are:-

- Asking questions
- Listening to student's response
- Providing guidance
- Making explanations etc.

Operations of teaching at interactive phase :

This phase of teaching

- Includes all those activities which a teacher uses after entering the classroom.
- Includes actual teaching done in the classroom.

In this face to face encounter with learners. Here the teacher uses some of the techniques, aids, and material planned in the first phase. This helps the teacher in achieving the relevant objectives that were already set. Here the following operations are undertaken by the teacher.

(1) Setting up the class :

It refers to the activity of perceiving the due size of the class, getting the feel of the mood of learners. Here teacher should be aware of

- how many in the group are looking attentive

- how many are negligent and disinterested
- who are sharper ones
- who are troublemakers etc.

(2) Knowing the learners :

Knowing the learners means to know about the previous knowledge of the new learners. It is done after preserving the class size. For this teacher can start by knowing the abilities, interests, attitudes and academic backgrounds of the new learners.

(3) Starting teaching :

At this stage, the teacher starts teaching. This is done after diagnosing by questioning. Here, two types of activities are involved.

1. Initiation
2. Response

The initiation and response are known as 'verbal interaction'. The interactive phase of teaching is the classroom interaction between teacher and students. The interaction may be verbal or non-verbal. Interaction is the most important at this stage. This is the interchange between teacher and student by initiation or response operations. In this phase, all the activities performed by a teacher when he enters the classroom are combined together. These activities one concerned with the presentation of content in the class.

3.4.3. The post-active phase of teaching :

Post Active stage appears as a suffix to the activity of teaching. The basic point of this stage is that the teacher is so overpowered by the events of the interactive setting that he continues to think about their meaning even after they have disappeared. Hence this gives a firm basis for correcting the mistakes and reorganizing the instructional system with suitable orientations on subsequent occasions. The important operations of this stage are recollecting, listing, extrapolating, formulating a guideline and weighing the evidence.

All the three stages may be viewed as an interrelated set as the impact of the decision and action in one stage may be analyzed during the subsequent stage. The researches on teaching have concentrated on the study of interactive stages even to the exclusion of pre active and post active stages which are so integrally connected. Hence, the present investigator has been urged to make efforts to set right the imbalance through her scientific probe of the model of teaching.

It is the evaluation phase of teaching. It arises when the teacher has left the class and tries to have a look back into what happened in the class. This phase is concerned with the following activities.

a) Evaluation Activities :

These activities are performed in various ways-

- Tests or quizzes
- Observing student's reactions to questions,
- Instructional situations and comments etc.

b) Summing up teaching tasks :

To sum up, the teacher asks the questions from the learners, verbally or in written form. The behaviors of the students are also measured in order to evaluate their achievements.

In absence of all these evaluative activities, the entire learning process could be incomplete.

Activities/operations at the post-active phase

(1) Determining the exact dimensions of behavior changes :

Here the teacher compares the actual behavioral changes in students with their expected behavioral changes. If desired behavioral changes are observed in maximum students then it means that teaching strategies are very effective.

(2) Selection of testing devices and techniques :

For comparing desired and actual behavior changes, the teacher has to select appropriate, testing devices which are valid and reliable. For this criterion, tests are more preferred than the performance tests.

(3) Changing strategies of testing :

The student's testing result is also used for evaluating the effectiveness of instructions and teaching strategies. It should provide a base for improving the teaching and changing strategies of teaching.

Importance of operations in different phases of teaching :

1. It focuses on bringing desired behavior changes in the students.
2. It provides the scientific basis for developing effective instructions of the teaching.
3. The classroom teaching and interaction can be made effective with this background.
4. Teaching operations ultimately create the appropriate conditions of learning for achieving the desired goals.

5. Teaching can be organized effectively at different levels by employing appropriate teaching activity.

So we can say that the process of teaching starts even before the teacher enters the classroom. It continues even after class. It continues even after classroom interaction in the form of evaluation, feedback, and other activities. All three teaching phases are interrelated; each one helps to modify the other in order to make teaching more meaningful and significant.

3.5 Pedagogy of Teaching Learning: 3 R's, Verbal Conditioning and Psychomotor Skills

3.5.1 Pedagogy of Teaching Learning: 3 R's Concept :

The three R's indicate the basic skills taught in the schools: Reading, Writing and Arithmetic. The phrase appeared in print as a space-filler in "The Lady's Magazine" for 1818; while it is sometimes attributed to a speech given by Sir William Curtis in 1975 about the publication of 'The Mirror of Literature, Amusement and Instruction casts doubt on this. The skills themselves allude to those first, where to read, and to write, and ciphering is being learned.' Ciphering translates differently and can be defined as transposing, arguing, reckoning, a secretive method of writing, or numerating. Since its original creation, many others have used the term to describe other triples. An extended modern version of the three R's consists of the "functional skills of literacy, numeracy and ICT.

The phrase "the three R's" is used because each word in the phrase has a strong 'R phoneme' (sound) at the beginning. The term is ironic, since someone with rudimentary language education would know that two of the original words do not actually begin with the letter R. The third R was more probably Reckoning, not as is more usually stated 'Rithmetic. Reckoning was a Victorian term for mental arithmetic and had been in use as such since the 14th century. The educationalist L.P. Benezet preferred "to read", "to reason", "to recite", adding, "by reciting he did not mean giving back, verbatim, the words of the teacher or of the textbook. He meant speaking the English language." In the United States, during the 17th century, the curriculum in the common (elementary) schools of the New England colonies was summed up as the "four R's" - Reading, 'Riting, "Rithmetic", and Religion.

In the early stage of institutional learning, teachers often focused on the "Three R's." These are reading, writing, and arithmetic. These three basics were the mainstay of education. However, as technology progresses, more and more schools are undermining these basic principles because students need to know more and be able

to work with computers, software, and other pieces of technology. The "three R's" can become discounted as basic and fundamental learning tools.

But it is understandable that students were initially focused on reading, writing, and arithmetic while also learning science, art, and technology in the school system in the future. In fact, the school system drills down beyond these basic three tenets of learning to teach students how to both evaluate and use new information. We feel the point of education is not only to show a student how to gain more knowledge, but how to absorb and use that knowledge in a practical manner.

The "Three R's" Are Relevant Today

Education has always gone beyond the basics of "reading, writing, and arithmetic." However, the "Three R's" are tools with which a student can gain more knowledge in any subject. If a student can read and write, he or she can complete a research project and learn to type. If a student understands the basics of arithmetic, he or she can learn to program complex algorithms or study science.

Role of Teacher :

As a teacher, we can help your young learn the Three R's of education and improve his or her life. Here are a few things you can do to help your child learn these important educational basics :

- Read to and/or with your child.
- Write your children handwritten notes, and ask them to do so back.
- Encourage your student to use a dictionary to help him or her spell words and look up the meanings of words.
- Build something with your student, using a plan that defines the length and width of objects.
- Encourage them to write holiday and birthday cards.
- Ask your students to keep a journal of questions he or she has asked to which you do not know the answer. On the weekend, take them to the library to discover the answers. Alternatively, show them how to research the answer to such questions on the internet - while avoiding dubious websites.
- Planning a trip or vacation, for children in calculating distances, mapping where you need to go, and writing the overall itinerary.

All of these actions can help your youngster improve his or her skills in reading, writing, or arithmetic. Additionally, they teach your child how useful these skills are in a real-world setting.

The mission should be to give your children a strong educational foundation to reach his or her full potential. The Three R's coupled with our basic philosophy of helping students understand how to use their knowledge in a practical way keeps the young people we work with enthusiastic about growing their own education.

Developing countries in the process of teaching and learning. Studies and authoritative information show different magnitudes to solve the problem by identifying factors influencing mastering of 3R's. Geske and Ozola, for instance, did research in Latvia Russia and established that there are many different and usually very complex causes for the difference in the pupils' achievement level. They also consider those factors to be beyond school influence, such as the income level and education, but there are quite many other factors that can influence students' learning achievements at school. The results of the research have also proved that there is a close coherence between the meaning of education to parents and students' learning achievements, i.e., if education is regarded as a value in the family, there is a big possibility that children will have high learning achievement. Socio-economic conditions are also significant for early achievements in reading.

Morrow, Gambrell, Duke and Nero in his study advocate that during literacy teaching, teachers should break down the reading and writing into smaller parts that are easily learnable by pupils such as phonics, phonemic awareness and spelling. These could make it easy for learners to master reading and writing. Also he identified evidenced based best practices for literacy instruction such as, classrooms should reflect a culture that fosters literacy motivation as reading and writing for pleasure to be informed and performing tasks in the process of learning 3Rs. Promoting independent reading, time for self-selected reading and opportunities to use technologies accommodate the needs of individual students in mastering of 3Rs. found that different funding and grants were introduced to provide school management with resources to buy books, learning aids and school supplies, but have been marred by problems such as non-delivery and waste.

The school administration must therefore make sure that resources and books provided are well kept and are used effectively to improve mastery of 3Rs. Management and funding have therefore been identified as important factors in ensuring pupils mastery of 3R.Texas Education Agency in their research found that teaching methodologies are among factors that closely influence mastering of 3Rs. They argue that pupils expand their speaking and listening skills, their background and vocabulary knowledge in formal and informal activities as they engage in story time discussions, journal keeping, wide reading, and purposeful writing. Teaching methodologies therefore, help pupils in mastering 3Rs. Such methods as the use of pictures, independent practice, numbers, figures and sound can easily help pupils in mastering 3Rs.

Mediation in the teaching and learning process is another thing of importance. To mediate is simply to "bridge". The teacher should therefore act as a bridge in the learning process by creating an environment which helps learners' interaction with both the teacher and the learners. Chuunga in his research shows that methodologies used in teaching reading and writing rely on the use of a combination of approaches such as language and phonic approaches to teaching literacy. Teachers should therefore incorporate various methodologies and strategies that facilitate interaction. Teaching methodologies are very essential in ensuring pupils' master 3Rs as they play a big role in ensuring pupils are able to read, write and to do arithmetic. Assessments used in teaching 3Rs can also influence mastering of 3Rs. Gough and Tunmer suggested that reading difficulties can be assessed cognitively and the assessment should look into the mental processes, e.g. the ability of the child to decode and recognize words and symbols. A concrete experience is to be found in Tanzania where classroom teaching is mainly through cramming, reciting singing and copying notes from chalkboards. Letters and sound naming, which are the most important skills in the development of literacy skills, are learned by memorization. Children are given charts of letters to recite and reproduce to teachers as a way to improve mastering of 3Rs.

Matusevich in his research stated that the constructivism method of teaching children was most important. Children are not passive in knowledge, but active at making meaning, testing out theories, and trying to make sense out of the world and themselves. In mastering 3Rs as pupils learn through interaction with others in the groups as they construct their own understanding of the world they live in. Constructivist classrooms are diverse due to the fact that the teacher takes in the culture of the children. The teacher's role is to build an environment that allows children to make choices. The teacher is a facilitator and observer. Constructivist classrooms do more at promoting the children's social, cognitive, and moral development than teacher-centered programs and as a result, pupils' mastery of 3Rs can be realized.

Teacher Related Factors

Teachers should have time to work with and to consult each other, to visit each other's classrooms, and to make instructional decisions that improve coordination. A teacher is a guide in pupils' learning process of mastering 3R's. According to Tyson, teachers must take part in professional development that focuses on the implementation of 3Rs mastery. He further explains that teachers play a big role to guide pupils in mastering 3Rs.The ability, knowledge, methods of teaching and learning, assessment methods, professional development in 3Rs and instructional decisions of the teacher play a great role to ensure pupils in primary school are able to read, write and do arithmetic effectively.

Teachers must be respected and motivated by ensuring that they enjoy their work in terms of better salaries and a good working environment. In order for teachers to have morale in teaching 3Rs, their working environment must be conducive so that they can teach well. Having a very big number of pupils in a classroom makes it difficult for a teacher to assist each learner. Solving teachers' problems will therefore help pupils in primary schools in mastering 3R's as teachers will be comfortable with the working environment and as a result, they will teach well.

Learner Related Factors :

Individual effort made by learners can help them master 3R's in different ways including independent reading at home and at school. Many pupils in primary school try their level best to master 3R's but lack enough support from their teachers is also a fact. In Indian context some children supplement their studies by enrolling themselves in commercially-based tuition classes, but majority do not have access to these classes due to their high costs and end up dropping out of school probably due to the problems related to reading and writing. Selected learners should therefore be identified and worked upon to see to it that pupils do their part to master 3Rs.

3.5.2 Verbal Conditioning in Teaching-learning :

A major concern of psychology is the control, modification, and prediction of behavior. Learning, as an area of behavior, is the focus of inquiry in both psychology and education. Today, a prime concern of educators is the study of the conditions which affect learning. Since most learning occurs in a verbal context, the relevance of verbal conditions that affect learning is self-evident. One approach to the examination of verbal conditions which affect learning is the application of operant conditioning techniques. In past years, researchers have been concerned with operant conditioning as a means of modifying verbal behavior. The technique of verbal conditioning has evolved from these concerns.

Verbal conditioni.ng may be defined as an increase in the rate of verbal response when the response is followed by a reinforcing stimulus. A common sense example of this definition might be "an experiment," the purpose of which was to condition subjects to make connections about safe driving. The response class included statements elicited from the subject such as "One should not exceed the posted speed," or 'You should always slow down before approaching an intersection." Immediately after these comments were voiced, the experimenter said, "Good," or "That's a fine idea," attempting to reinforce and increase the number of statements from the subject about safe driving. Verbal conditioning as an end in itself has value in the laboratory situation. Its practical application, however, separate from or combined with other

techniques, may lie in the realm of behavior modification. It seems necessary, therefore, to explore verbal conditioning in terms of its effect on related behavior. Further, if an individual's verbal responses can be manipulated and if it can be demonstrated that the change is due to the reinforcing stimulus, still a question remains unsolved that "How reliably will this change generalize or transferable to other activities after verbal conditioning has occurred?"

Mediating processes and intervening variables such as the affective loading of certain response classes and social and cultural connotations of response classes may affect overt behavioral responses. Other intervening factors have been reported by Matthews and Dixon (1968) who suggest that the subjects' reactions to the characteristics of the examiner's voice (in case of classroom learning setting learner may be subject and teacher may be examiner) may influence the reinforcing stimulus and the degree of rapport existing between the experimenter and subject has an interactive effect with reinforcement. It is also possible that the subject and experimenter may differ in their semantic interpretation (denotation and/or connotation) of the verbal response.

The first factor which may contribute to this lack of conditioning is the nature of the response class, i.e., verbs depicting aggression. A larger response class, such as plural nouns, represents approximately twelve per cent of an individual's total verbal output. Plural nouns were more readily affected by reinforcement than were a smaller response class (modifiers) which represents approximately four per cent of the total verbal output. Aggressive verbs fall into the smaller response class of modifiers. Because of their lack of frequency or emission in the spoken language they may have less susceptibility to reinforcement.

The operant level (natural tendency to emit without reinforcement) of malevolent words was slightly lower than benevolent or neutral words so that less of an increase was needed to show conditioning. It has found that negative cultural connotations affect conditioning. The second factor which may contribute to the lack of conditioning relates to the method of conditioning. In this study the experimenter had minimal physical contact with the subject except for the short initial greeting. To maintain even greater standardization of the procedure all directions were taped and the subject's view of the experimenter was cut off by screens during the actual experiment. Solley and Long (1958) reported that if the experimenter and subject "chit-chatted" prior to the experiment there was a higher probability that conditioning would occur than if there was no pre-experimental interaction.

Systematically manipulated interactions between subject and guide might be fruitful. An initial task may be provided to the subject. He / she was then criticized, praised, or ignored. Subjects who had prior interaction with the experimenter evidenced greater

condition ability. These results suggest that pre-experimental interaction may have a facilitating effect on conditioning. The present experiment minimized pre-experimental interaction. Another factor which affects conditioning is the 'nature of the reinforcement' given the subject. Using a social approval form of reinforcement may produce better conditioning. Social reinforcement is viewed as attention to the child in the form of praise, approval, or adult verbalization of any kind. Social reinforcement is combined with the typical physical contacts with the child that are a part of the pre-school teacher's role. These include such behavior as picking the child up and brushing him off after a tumble, helping the child with clothing or giving him a friendly pat. The teacher frequently provides for the child in a direct physical sense by giving him snacks, special activities and extra materials. All, or any combination of these, are designated as adult social reinforcement.

The combination of verbal and social reinforcement which accounts for conditioning and behavior change. An experimental situation in which behavior is carefully controlled and verbal reinforcement is a voice coming from behind a screen may be too impersonal or vague for the subject to associate with the desired behavior change.

Implications of verbal conditioning procedures may be extended to 'influencing' processes other than psychotherapy: placebo effect, hypnosis, 'brainwashing', motor operant conditioning and soon. A theory of social motivation (more or less equivalent to physiological drive states) to account for enhancement of social influence following social deprivation. Potentially reinforcing stimuli must be studied in terms of the functional relatedness of reinforcements in the interaction between teacher or parent and child. In school children, who tend to be deprived of consistent adult contact and approval, should be more motivated to secure social reinforcement than non-institutionalized children.

Generalization of a reinforced verbal response has been investigated but the results have not been conclusive. It has been found in research studies with psychiatric patients who were reinforced for emotional words in story-telling sessions prior to group therapy. The patients who received positive-personal reinforcement showed a significant increase in the adequacy of their interpersonal relationships in the group setting, thereby demonstrating a generalization effect.

The manipulation of stimulus significance, by instructions from the experimenter, may be taken as an example of verbal conditioning. Consideration of such a mechanism suggested that personality effects previously found in conditioning studies should be apparent in instructional manipulations of significance in a study of the orienting response (OR) to words. Because of recent changes in dimensioning of the personality structure, some of the items originally used to define Eysenck's extraversion (E)

dimension are now used to assess the new dimension of psychoticism (P), suggesting that at least some of the established effects of E upon conditioning may be associated now with P.

Majority research findings tend to support a behavioral view of verbal conditioning and are incompatible with a purely cognitive approach. It could be argued that the amount of learning which occurred was small, and that the use of cognitive processes must precede the occurrence of more complete learning. It could also be argued that regardless of what one might arrange in a particular verbal interaction, intelligent people tend to use cognitive processes in most of their learning. It is simply that learning without awareness can be made to occur, given suitable conditions.

In typical classroom situations, verbal communicationis a message or information expressed in words, either orally or in writing. Classrooms obviously have lots of verbal communication; it happens every time a teacher explains a bit of content, asks a question, or writes information or instructions on the chalkboard. Classrooms tend to rely heavily on explicit, verbal communication, while at the same time recognizing and allowing nonverbal communications to occur (Neill, 1991). This priority accounts for the characteristically businesslike style of teacher talk. A major reason for relying on an explicit, verbal style is that diversity among individuals increases the chances of their misinterpreting each other. Because of differences in background, the partners may differ in how they expect to structure conversation as well as other kinds of dialog. Misunderstandings may result sometimes without the partners being able to pinpoint the cause. Later in this chapter we suggest how to minimize these problems.

Effective verbal communication

Communicating effectively requires using all forms of classroom talk in combinations appropriate for particular utterances and interactions. In various places earlier in this book, we have suggested ways of doing so, though in those places we usually did not frame the discussion around the term communication as such.

Effective content talk

The ways of talking about content so that it is most likely to be understood clearly, and its need for instructional strategies. In explaining ideas, for example, whether briefly or as an extended lecture, it has been pointed out that it helps to offer, in advance, organizing ideas, to relate new content to prior knowledge, and to organize and elaborate on new information. It needs certain strategies about content talk intended for students, so that students understand their own thinking as well as possible. The following table as advocated by Kelvin Seifert (2009) summarizes instructional strategies both for students and for teachers, and indicates how they contribute to effective verbal communication about content.

Teacher Talk :		
Strategy	**Definition**	**How it helps communication**
Using advance organizers	Statements or ideas that give a concise overview of new material	Orients students' attention to new ideas about to be learned; assists in understanding and remembering new material
Relating new material to prior knowledge	Explicit connections of new ideas to students' existing knowledge	Facilitates discussion of new material by making it more meaningful to students
Elaborating and extending new information	Explanations of new ideas in full, complete terms	Avoids ambiguities and misunderstandings about new ideas or concepts
Organizing new information	Providing and following a clear structure when explaining new material	Assists in understanding and remembering new material

Content talk by Student		
Strategy	**Definition**	**How it helps communication**
Inquiry learning	Students pursue problems that they help to formulate for themselves	To formulate and investigate a problem, students need to express clearly what they wish to find out.
Cooperative learning	Students work in small groups to solve a common problem or task	To work together, students need to explain ideas and questions to fellow students clearly.

Effective procedural and control talk

In addition to communicating about content, teachers need to communicate procedures and expectations about appropriate classroom behavior. Procedural talk is a method of classroom management, of creating a positive learning environment, and of resolving conflicts in the class. The following table summarizes several of the major strategies according to Kelvin Seifert (2009). By framing communication in these ways, we called attention to their importance as forms of communication. As we pointed out, procedural talk and control talk matter are used in teaching simply because clear procedures and appropriate classroom behavior are necessary for students to learn.

Procedural talk	Control talk
Creating and discussing procedures for daily routines	Creating and discussing classroom rules of appropriate behavior
Announcing transitions between activities	Clarifying problem ownership
Providing clear instructions and guidance for activities	Listening actively and empathetically
Reminding students periodically of procedures for completing a task	Using I-messages

It has been understood that all such verbal communications in the classroom is based on the principle of verbal conditioning which affects the learning.

3.5.3 Inculcation of Psychomotor Skills through Teaching :

In general skill is defined as a stable and reliable link between perception of body and environment, and execution of goal-directed motor actions, which is both consistent across repeated performances of the action, and can be flexibly adapted to changes in task constraints. Skill in this sense is therefore considered primarily as a perceptual-motor function. Examples of perceptual-motor skills include instrumental music performance, driving a car etc. This category of skill might be contrasted with more cognitive or 'intellectual' skills, such as mathematical reasoning. It is worth noting, however, that both categories of skill (perceptual-motor and intellectual) may share processes in common, and much may be learnt by considering the acquisition of expertise across a broad range of academic achievement. In engineering and medical science along with all laboratory or field-based activities psychomotor skills are much more relevant. Hence, psychomotor skills represent those activities that are primarily movement-oriented. In teaching, emphasis is placed on this movement component, although ultimately in practice, performance requires an integration of related knowledge and values (Oermann, 1990).

According to Psychomotor learning-, movement, coordination, manipulation, dexterity, grace, strength, speed; actions which demonstrate fine motor skills such as use of precision instruments or tools.

Characteristics of skill acquisition :

Over the previous century, many psychological theories of skill acquisition have been proposed, such as those of Fitts and Posner, Anderson and Gentile. There are differences in different psychological frameworks, the core concepts that may inform

the development of effective training structures to support skill learning may be discussed.

Two common and related principles across different theories of skill acquisition are that :

1. Changes in performance due to training and practice proceed in a non-linear manner.

2. As the trainee advances in perceptual-motor learning, the way that they process the task and action will change through qualitatively different phases.

The first principle is illustrated by the commonly observed learning curves, in which improvements in the performance outcomes (such as increased speed, reduced error) will be rapid during early trials, but then decelerate with increased practice. This slowing down of improvement rate as learning progresses may be due to a number of factors.

The second principle - those learners come to process the task in qualitatively different ways with advanced skill acquisition - is often characterized by a stage-based account of learning. For example, learners in an early stage of skill acquisition will rely on explicit rules about the action and the information relevant to the task, whereas more advanced learners will have developed implicit associations between task-relevant information and appropriate motor responses.

In perceptual - motor skill acquisition, many of the processes involved can be characterized as 'tuning' the goal directed nervous system to the constraints of the task. This tuning process applies to movement, perception and attention, each of which is discussed in turn.

Movement

A fundamental property of perceptual-motor learning is the improvement of precision and consistency of the spatial- temporal control of limbs. In learning to play a guitar, the practicing musician must come to get their fingers to the right place, at the right time, and to pluck the string with the correct force. These factors can become highly precise and consistently repeatable over many instances - indeed, this is the impressive aspect of skill. However, even in highly practiced movements, there is still variability in motor production.

Practice might have a very crucial role, through practice, the learner's nervous system will tune into the space of outputs that maximize precision and invariance in the task-relevant dimensions. While there is much debate about exactly how the brain achieves this, one thing that seems clear is that the motor system needs to explore the space of movement possibilities in order to zone in on those that are most aligned

with task success. This may account for the finding that greater motor variability early on in skill learning is associated with accelerated learning later on. Hence, allowing the students / trainee to fully explore the possible movement space early in field or practical work may lead to improved motor control outcomes later.

Perception

As well as creating the correct movement output, essential to the achievement of skill is sensitivity to perceptual information about the changing position of the body in relation to the desired end point and also, task-relevant external factors. It can be seen that perception of the task is very different between novice and expert. Whereas novice chess players view the board in terms of the individual pieces and their current position, the expert player sees the board as a unified pattern, with particular opportunities for future moves. Moreover, such differences in perception are tuned into the task at hand. In football, more skilled goalkeepers visually sampled curved free kicks for longer than novices, with the result that their actions were not as susceptible to the deceptive motion in the early part of the ball trajectory. Experts are also more sensitive to the useful perceptual information available and can use this to anticipate future events. This may explain the benefits of 'implicit learning' : in the absence of explicit rules, the trainee has to abstract from the patterns in their sense the variables that directly specify the appropriate (successful) action.

Attention

Related to perception is the concept of attention in skill acquisition, that is, what information the learner focuses on. In sight-reading (playing music from a score that has never been seen before), more skilled piano players look further ahead, taking in a greater band width of information and attending to future events. This tuning of attention gives the skilled performer an advantage in maximizing the efficiency of cognitive resources, which is important as such resources may be reduced in stressful or unpredictable situations. It is also worth noting that expert performers generally have an external focus of attention, concentrating on the environment and the task goal.

Simulation training and assessment

Development of a curriculum for simulation training in applied science must consider the characteristics of the learner. The potential for learning will be strengthened if trainees are given the autonomy to decide what and when they practice. However, they should have defined goals and learning objectives relevant to their stage of training and, in parallel, a current training syllabus. Practice in the real field will improve technical skill; however, the use of virtual reality simulators reduces operation time

and improves performance when compared with no training. So online training through simulation is a growing option.

Summative assessment

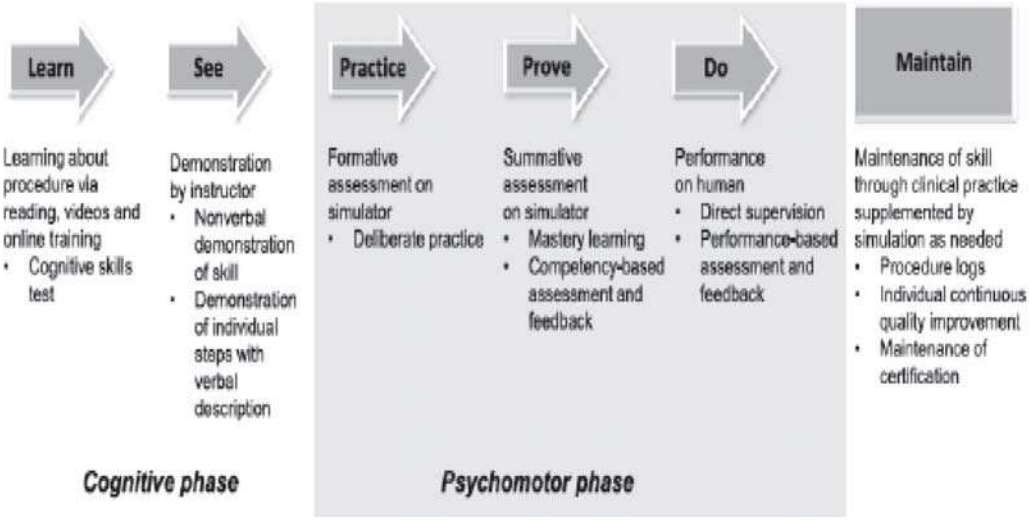
The benefits of different forms of feedback at different stages of the learning curve need to be considered. However, in order to prove that certain proficiencies have been met, trainees will require some method of objective summative assessment of their skills. This may be deemed necessary to progress to the next stage of their curriculum or to allow operating privileges.

Objective structured assessment of technical skills (OSATS) has been employed to evaluate performance in any applied course objectively for many years. However, the format is mainly considered to be valid as a measure of progress of training rather than examination or credentialing and has not been evaluated for assessment of simulation training.

Taxonomy of progressive skills development (Dave, 1970) :

1. Imitation
2. Manipulation
3. Precision
4. Articulation
5. Naturalization

The pedagogical framework proposed by Sawyer et. al. (2011) for psychomotor skill training is as follows : Pedagogical framework for procedural skills training



Mastery learning (Bloom, 1968) 'an instructional approach requiring learners to achieve a defined proficiency before proceeding to the next instructional objective, offers one approach to individualization."

"Basic principles of mastery learning are that educational excellence is expected and can be achieved by all learners and that little or no variation in measured outcomes will result." (McGaghie et al., 2015). The simulation-based mastery learning follow steps are important–

1. Baseline, or diagnostic testing
2. Clear learning objectives, sequenced
3. Engagement in educational activities
4. A set minimum passing standard (e.g., test score)
5. Formative testing to gauge unit completion at a preset minimum passing standard for mastery
6. Advancement to the next educational unit given measured achievement at or above the mastery standard
7. Continued practice or study on an educational unit until the mastery standard is reached.

Verbal guidance also might be instrumental in instructional approach-as advocated by Sutkinet al, (2015)–

1. Didactic (descriptive about current step or anatomy)
2. Commanding (highly specific command)
3. Explanatory (offers rationale)
4. Deictic (context specific - here, there…)
5. Indirect ("I wish I could see")
6. Terse (laconic utterance)
7. Polite (prefix to a statement might imply discussion point)
8. Planning (talk about future steps)

Such skill training may be designed with proper instructional steps for school level students too. But in tertiary education specially applied science learning this skill training is much more relevant.

3.6 Summary

In this Unit you have learnt :

- Teaching brings out the following qualities about concept of teaching :

1. Teaching is a system of activities. In other words, it is a number of logically contrived sets of activities having a specific structure, form and orientation.
2. Teaching aims at changing others or causing learning in others. Without a suitable goal or objective, no worthwhile teaching can be arranged.
3. The core of the teaching act is increment between teacher, learners, and subject matter. Thus it is by its very nature a social enterprise involving dynamic interaction among a triad.
4. Teaching involves an influence orientation where the direction of focus of control is from the teacher to the learner.
5. Teaching does not just occur, rather it is a planned and an implemented set of activities in an interactional setting in terms of the prior thought about the learning goals, instructional strategies and the subject matter configuration.

- **Principles of teaching can be summarized as follows :**
  - Principle of using previous knowledge
  - Principle of providing for individual difference
  - Principle of readiness
  - Principle of meaningfulness
  - Principle of defining specific objectives of the lesson
  - Principle of proceeding from simple to complex
  - Principle of proceeding from concrete to abstract
  - Principle of proceeding from general to specific
  - Principle of proceeding from known to unknown
- **Functions of Teaching :**

1. Attending to people's feelings, experiences and needs
2. Plan their interventions accordingly
3. Facilitating learning particular things
4. Making specific interventions : • Recognizing and cultivating teachable moments • Cultivating collaborative relationships for learning • Scaffolding • Differentiation • Accessing resources for learning • Adopting a growth mindset

- Teaching has to be done in steps. The different steps constituting the process are called the phases of teaching. Each phase has some operations of teaching which create the situation for learning. Teaching process can be divided into three phases/stages.

1. Pre-active phase - refers to planning
2. Interactive phase - refers to the conduct and management
3. Post-active phase - refers to the follow-up and consolidation

Pre-active phase : Writing a teaching unit or lesson plan is also an important activity in the pre-active stage of teaching. Therefore,

a. It is the phase of planning for teaching.
b. Good planning makes the task of the teacher smooth, functional and successful.
c. There one two major steps involved in this phase.
   - Establish some kind of goals or objectives.
   - Discovering ways and means to activate these objectives.

Interactive phase : The actual implementation phase of the planned instructional system is the Interactive stage. It arises from face to face encounters in a social situation in which the teacher communicates knowledge, information or skill to the pupils with references to a subject matter.Operations of teaching at interactive phase are : • setting up the class • knowing the learners • starting teaching-initiation & response.

Post Active Phase : It appears as a suffix to the activity of teaching. The basic point of this stage is that the teacher is so overpowered by the events of the interactive setting that he continues to think about their meaning even after they have disappeared. Hence this gives a firm basis for correcting the mistakes and reorganizing the instructional system with suitable orientations on subsequent occasions. The important operations of this stage are recollecting, listing, extrapolating, formulating a guideline and weighing the evidence.

• The three Rs indicates the basic skills taught in the schools: Reading, Writing and Arithmetic. The phrase appeared in print as a space-filler in "The Lady's Magazine" for 1818. The educationalist L.P. Benezet preferred "to read", "to reason", "to recite", adding, "by reciting he did not mean giving back, verbatim, the words of the teacher or of the textbook. He meant speaking the English language." In the United States, during the 17th century, the curriculum in the common (elementary) schools of the New England colonies was summed up as the "four Rs" - Reading, 'Riting, "Rithmetic", and Religion. Teachers should therefore incorporate various methodologies and

strategies that facilitate interaction. Teaching methodologies are very essential in ensuring pupils' master 3Rs as they play a big role in ensuring pupils are able to read, write and to do arithmetic. Assessments used in teaching 3Rs can also influence mastering of 3Rs.

• Psychomotor skills represent those activities that are primarily movement-oriented. In teaching, emphasis is placed on this movement component, although ultimately in practice, performance requires an integration of related knowledge and values.

According to Psychomotor learning -,movement, coordination, manipulation, dexterity, grace, strength, speed; actions which demonstrate fine motor skills such as use of precision instruments or tools.

Two common and related principles across different theories of skill acquisition are that :

1. Changes in performance due to training and practice proceed in a non-linear manner.

As the trainee advances in perceptual-motor learning, the way that they process the task and action will change through qualitatively different phases.

Taxonomy of progressive skills development :

1. Imitation
2. Manipulation
3. Precision
4. Articulation
5. Naturalization

Such skill training may be designed with proper instructional steps for school level student too. But in tertiary education specially applied science learning this skill training is much more relevant.

3.7 Self-Assessment Questions

1. What is meant by Teaching? Elaborates the principles of Teaching.
2. What are the Functions of teaching?
3. Differentiates between the teacher centered and student-centered teaching.
4. Critically judge the pedagogical implications of the pre-active phase of teaching.
5. Explain the operations of the interactive phase
6. Mention the general significance of phases of teaching

7. Justify the role of the teacher in ensuring three R's factors of learning. Briefly explain the concept of Verbal conditioning.
8. What is meant by psychomotor skill? Mention the taxonomy of progressive skill development.
9. Explain teaching as a process with Reflection and Feedback in Teaching.

3.8 References

Beere, J. (2012). The Perfect (Ofsted) Inspection. Crown House Publishing.

Beere, J. (2015). The Perfect Lesson-: Revised and updated. Crown House Publishing.

Bloom, B. S. (1956). Taxonomy of educational objectives. Vol. 1: Cognitive domain. New York: McKay, 20(24), 1.

Bloom, B. S. (1968). Learning for Mastery. Instruction and Curriculum. Regional Education Laboratory for the Carolinas and Virginia, Topical Papers and Reprints, Number 1. Evaluation comment, 1(2), n2.

Bloom, B., ENGELHARDT, M., FURST, E., HILL, W., & KRATHWORTH, D. (1968). Taxonomy of Educational Objects. The Classification of Educational Goals. Handbook 1. Cognitive Domain.

Bruner, J. S. (1978). The role of dialogue in language acquisition. In A. Sinclair, R., J. Jarvelle, and W. J.M. Levelt (eds.) The Child's Concept of Language. New York: Springer-Verlag. Carol Dweck, C. S. (2012). Mindsets and human nature: promoting change in the Middle East, the schoolyard, the racial divide, and willpower. American Psychologist, 67(8), 614.

Coe, R., Aloisi, C., Higgins, S., & Major, L. E. (2014). What makes great teaching? Review of the underpinning research. http://www.suttontrust.com/researcharchive/great-teaching/, accessed on November 26, 2020.

Dave, R.H. (1970). Psychomotor Levels. In Developing and Writing Behavioral Objectives, (Eds.) Robert, J. Armstrong. Tucson, AZ: Educational Innovators Press.

Dweck, C. S. (2012). Mindsets and human nature: Promoting change in the Middle East, the schoolyard, the racial divide, and willpower. American Psychologist, 67(8), 614.

Flanders, N. A. (1970). Analyzing teaching behavior. Addison-Wesley.

Geske, A., &Ozola, A. (2008). Factors influencing reading literacy at the primary school level. Problems of Education in the 21st Century, 6, 71.

Greenspoon, J. (1962). Verbal conditioning and clinical psychology. In Bachrach, A. J. (Ed.) Experimental foundations of/ clinical psychology. New York: Basic Books.

Gronlund, N. E. (1971). Measurement and Evaluation in Teaching: Second edition. New York: Macmillan.

Haas, K. (1962). Verbal conditioning of affective responses. The Journal of general psychology, 67(2), 319-322.

Hattie, J. (2009). The black box of tertiary assessment: An impending revolution. Tertiary assessment & higher education student outcomes: Policy, practice & research, 259, 275.

Havighurst, R. J. (1953). Human development and education. Longmans, Green.

Hirst, P. (1975). What is teaching? In R. S. Peters (ed.) The Philosophy of Education. London: Routledge and Kegan Paul.

Jeffs, T. and Smith, M. K. (2018) Informal Education.London: Educational Heretics.

K. Mitra (?)

Krasner, L. (1958). Studies of the conditioning of verbal behavior. Psychol. Bull., 55, 148-170

Lieberman, M. D. (2013). Social: Why our brains are wired to connect. OUP Oxford.

Mager, R. 1962. Preparing Instructional Objectives, revised 2nd edn, Belmont, CA: David Lake Publishers.

Matthews, G., & Dixon, T. R. (1968). Differential reinforcement in verbal conditioning as a function of preference for the experimenter's voice. Journal of Experimental Psychology, 76(1p1), 84.

McGaghie, W. C., Barsuk, J. H., & Wayne, D. B. (2015). Mastery learning with deliberate practice in medical education. Academic Medicine, 90(11), 1575.

N., Pam M.S. (2013). VERBAL CONDITIONING available at http:// www.oxforddictionaries.com Accessed on November 26, 2020.

Neill, S. (1991). Classroom nonverbal communication. New York: Routledge.

Ofsted (2015). The common inspection framework: education, skills and early years. London: Ofsted. Retrieved on November 24, 2020 from https:// assets.publishing.service.gov.uk/government/uploads/system/uploads/ attachment_data/file/461767/The_common_inspection_framework_ education_skills_and_early_years.pdf.

Palmer, P. J. (2017). The courage to teach: Exploring the inner landscape of a teacher's life. John Wiley & Sons.

Pandey, K. P. (1997). Modern Concepts of Teaching Behaviour. Anamika Pub & Distributors.

Petty, G. (2009). Evidence-based teaching. Nelson Thornes.

Salzlnger, K. (1959). Experimental manipulation of verbal behavior: a review. J. gen. PsychoI., 61, 65-94.

Sawyer, R. K. (2011). Explaining creativity: The science of human innovation. Oxford university press.

Seifert, K. (2009). Narrative as a Basis for Teaching Educational Psychology. Teaching Educational Psychology, 3(3), n3.

Seifert, K. (2009). Narrative as a Basis for Teaching Educational Psychology. Teaching Educational Psychology, 3(3), n3.

Skinner, B.F. (1968). The Technology of Teaching. New York: Meredith Corporation.Berliner.

Smith, M. K. (2015). What is education? A definition and discussion. The encyclopedia of pedagogy and informal education. Retrieved February 17, 2020, from https://infed.org/mobi/what-is-education-a-definition-and-discussion/.

Snook, I. (1972). Concepts of Indoctrination: Philosophical Essays. London: Routledge and Kegan Paul.

Solley, C., and Long, J. When is "uh-huh" reinforcing? Perceptual Motor Skills, 1958, 8, 277.

Sutkin, G., Littleton, E. B., & Kanter, S. L. (2015). How surgical mentors teach: a classification of in vivo teaching behaviors part 1: verbal teaching guidance. Journal of surgical education, 72(2), 243-250.

Teaching as a Process: Pre-active, Interactive and Post-active Source: https://physicscatalyst.com/graduation/phases-of-teaching/ Accessed on February 22, 2020.

Wood, D. J., Bruner, J. S., & Ross, G. (1976). The role of tutoring in problem solving. Journal of Child Psychiatry and Psychology, 17(2), 89-100.

Zwozdiak-Myers, P., Whitehead, M., & Capel, S. (2013). 15 Your Wider Role as PE Teacher. Learning to Teach Physical Education in the Secondary School: A Companion to School Experience, 239.

MODULE – 2

Unit–4 : Cognition

Structure

4.1 Objectives

In this Unit, we have tried to introduce you to the neural basis of sensation and perception and cognitions as mental processes are related with neural structure.

After the end of this unit you should be able to :

- Explain Neural basis of Sensation
- Illustrate the structure and function of neural components
- Explain the structure and function of human brain
- Identify and explain the factors influencing perception
- Explain the relationship between cognition and teaching

4.2 Introduction

Learning is related to perception and cognition. Learning- teaching is an indisputably psychological phenomenon dependent on cognition. Perception and cognition are the mental processes that depend upon the central nervous system. We will try to present you here with a number of ideas to understand the Neuron-Structure, Electrical Potential, Synaptic Transmission, Structure and Function of Human Brain, Neuro-Endocrine System and apart from that we also introduce you to the concept of perception and cognition in relation to teaching.

4.3 Neural basis of Sensation: Neuron-Structure, Electrical Potential, Synaptic Transmission, Structure and Function of Human Brain, Neuro-Endocrine System

4.3.1 Neuron-Structure, Electrical Potential, Synaptic Transmission

Everyday different stimuli around us will be stimulating our sense organs and are converted into sensations. Perception is the process by which an organism detects and interprets information from the external world by means of the sensory receptors. Cognition is the act or process of knowing in the broadest sense; specifically, an intellectual process by which knowledge is gained from perception or ideas. Perception and cognition are the mental processes that depend upon the central nervous system. Thus, the understanding of structure and function of neural components are essential to understand learning-teaching.

Nerve impulse

A nerve impulse is the relaying of a coded signal from a nerve cell to an effector (a muscle cell, a gland cell or another nerve cell) in response to a stimulus. It is the means by which a nerve cell communicates with another cell. This signal is relayed along the axon of the nerve cell, bringing a message that instructs an effector to act. For instance, in neuromuscular junction, the nerve impulse moves along the axon of a nerve cell to instruct a muscle cell to contract.

Neuron

There are unique structural features present in neurons. There are also synapses, the specialized sites where neurons send and receive information from other cells, and some of the circuits that allow groups of neurons to coordinate complex processes. Neurons have three basic parts:

Cell body or soma : This main part has all of the necessary components of the cell, such as the nucleus (which contains DNA), endoplasmic reticulum and ribosomes

(for building proteins) and mitochondria (for making energy). If the cell body dies, the neuron dies.

Axon : This long, cable-like projection of the cell carries the electrochemical message (nerve impulse or action potential) along the length of the cell. Depending upon the type of neuron, axons can be covered with a thin layer of myelin sheath, like an insulated electrical wire. Myelin is made of fat and protein, and it helps to speed transmission of a nerve impulse down a long axon. Myelinated neurons are typically found in the peripheral nerves (sensory and motor neurons), while non-myelinated neurons are found in the brain and spinal cord.

Dendrites or nerve endings : These small, branchlike projections of the cell make connections to other cells and allow the neuron to talk with other cells or perceive the environment. Dendrites can be located on one or both ends of a cell.

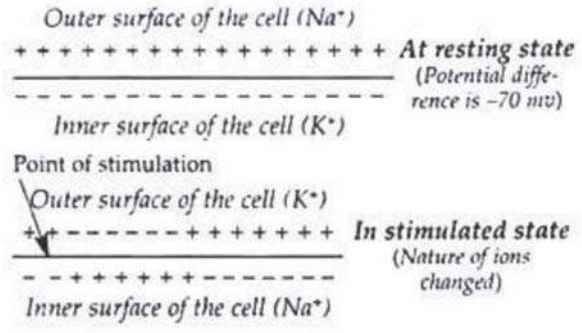
Classification of stimulus

(a) **Subliminal stimulus :** Subliminal stimuli (the prefix sub- literally "below, or less than"), contrary to supraliminal stimuli or "above threshold", are any sensory stimuli below an individual's threshold for conscious perception. A 2012 review of functional magnetic resonance imaging (fMRI) studies shows that subliminal stimuli activate specific regions of the brain despite participants being unaware. Visual stimuli may be quickly flashed before an individual can process them, or flashed and then masked, thereby interrupting the processing. Audio stimuli may be played below audible volumes or masked by other stimuli.

(b) **Supraliminal stimuli :** Which can produce the LES to action potential.

Origin of Nerve impulse

In resting nerve cells, the surface is posi-tively charged and the interior is negatively charged. When the surface is stimulated the stimulated point becomes negative. The fluids both inside and outside the cell are electro-lytic solutions containing 150-160m Eq/litre. Positive ions and negative ions are accumu-lated along the outer and inner surface of the cell membrane, respectively. This is achieved by Na+ outside and K+ inside the cell mem-brane, and because Na+ is placed above the K+ in the electrochemical series.

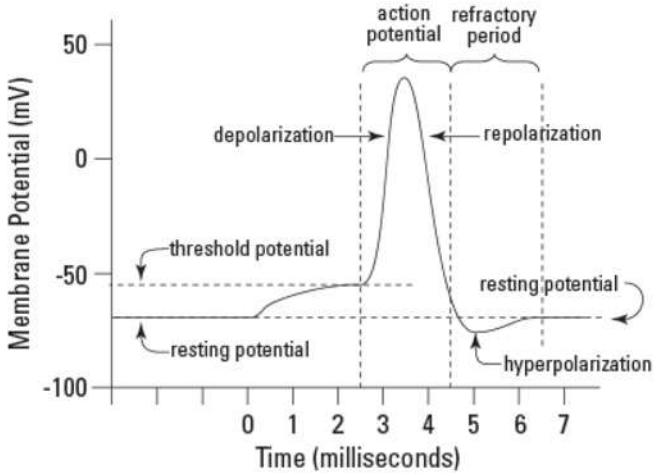


Transmission of Nerve Impulses

The transmission of a nerve impulse along a neuron from one end to the other occurs as a result of electrical changes across the membrane of the neuron. The membrane of an unstimulated neuron is polarized-that is, there is a difference in electrical charge between the outside and inside of the membrane. The inside is negative with respect to the outside. Polarization is established by maintaining an excess of sodium ions (Na +) on the outside and an excess of potassium ions (K +) on the inside. A certain amount of Na + and K + is always leaking across the membrane through leakage channels, but Na +/K + pumps in the membrane actively restore the ions to the appropriate side.

The main contribution to the resting membrane potential (a polarized nerve) is the difference in permeability of the resting membrane to potassium ions versus sodium ions. The resting membrane is much more permeable to potassium ions than to sodium ions resulting in slightly more net potassium ion diffusion (from the inside of the neuron to the outside) than sodium ion diffusion (from the outside of the neuron to the inside) causing the slight difference in polarity right along the membrane of the axon. Other ions, such as large, negatively charged proteins and nucleic acids, reside within the cell. It is these large, negatively charged ions that contribute to the overall negative charge on the inside of the cell membrane as compared to the outside.

In addition to crossing the membrane through leakage channels, ions may cross through gated channels. Gated channels open in response to neurotransmitters, changes in membrane potential, or other stimuli. The following events characterize the transmission of a nerve impulse (see Figure 1) :



Resting potential : The resting potential describes the unstimulated, polarized state of a neuron (at about -70 millivolts).

Graded potential : A graded potential is a change in the resting potential of the plasma membrane in the response to a stimulus. A graded potential occurs when the stimulus causes Na + or K + gated channels to open. If Na + channels open, positive sodium ions enter, and the membrane depolarizes (becomes more positive). If the stimulus opens K + channels, then positive potassium ions exit across the membrane and the membrane hyperpolarizes (becomes more negative). A graded potential is a local event that does not travel far from its origin. Graded potentials occur in cell bodies and dendrites. Light, heat, mechanical pressure, and chemicals, such as neurotransmitters, are examples of stimuli that may generate a graded potential (depending upon the neuron).

The following four steps describe the initiation of an impulse to the "resetting" of a neuron to prepare for a second stimulation:

Action potential : Unlike a graded potential, an action potential is capable of traveling long distances. If a depolarizing graded potential is sufficiently large, Na + channels in the trigger zone open. In response, Na + on the outside of the membrane becomes depolarized (as in a graded potential). If the stimulus is strong enough-that is, if it is above a certain threshold level-additional Na + gates open, increasing the flow of Na + even more, causing an action potential, or complete depolarization (from -70 to about +30 millivolts). This in turn stimulates neighboring Na + gates, farther down the axon, to open. In this manner, the action potential travels down the length of the axon as open Na + gates stimulate neighboring Na + gates to open. The action potential is an all?or?nothing event: When the stimulus fails to produce depolarization that exceeds the threshold value, no action potential results, but when threshold potential is exceeded, complete depolarization occurs.

Repolarization : In response to the inflow of Na +, K + channels open, this time allowing K + on the inside to rush out of the cell. The movement of K + out of the cell causes repolarization by restoring the original membrane polarization. Unlike the resting potential, however, in repolarization the K + are on the outside and the Na + are on the inside. Soon after the K + gates open, the Na + gates close.

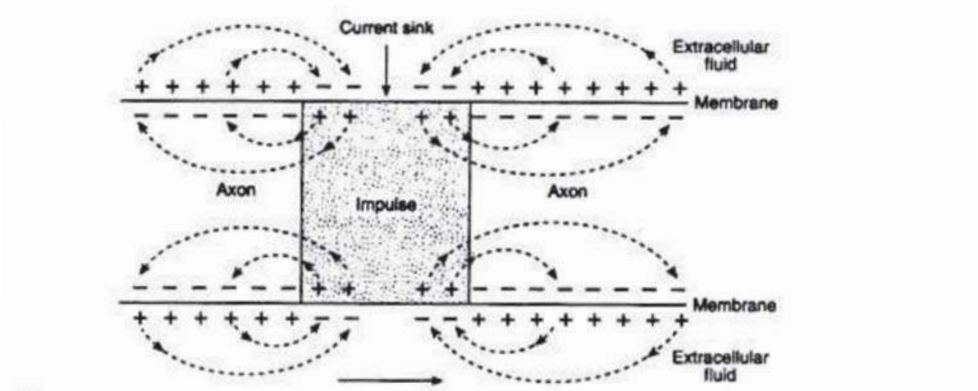
Hyperpolarization : By the time the K + channels close, more K + have moved out of the cell than is actually necessary to establish the original polarized potential. Thus, the membrane becomes hyperpolarized (about -80 millivolts).

Refractory period : With the passage of the action potential, the cell membrane is in an unusual state of affairs. The membrane is polarized, but the Na + and K +

are on the wrong sides of the membrane. During this refractory period, the axon will not respond to a new stimulus. To reestablish the original distribution of these ions, the Na + and K + are returned to their resting potential location by Na +/K + pumps in the cell membrane. Once these ions are completely returned to their resting potential location, the neuron is ready for another stimulus.

Propagation in non-medullated nerve fiber :

According to membrane theory, nerve impulse is a propagated wave of depolarization. When the fibre is excited at a point, the polarity is reversed. This reversed polarity is due to increased permeability of Na+ to the membrane which develops depolarization. A local circuit current flows between the depolarised membrane and the resting membrane areas. Positive current flows inward through the de-polarised membrane and out-ward through the resting membrane and in this way the circuit is completed. The local de-polarisation current then exits the adjacent portion of the mem-brane progressively more and more de-polarisation. The depolarization wave travels in all directions along the entire length of the nerve fibre.

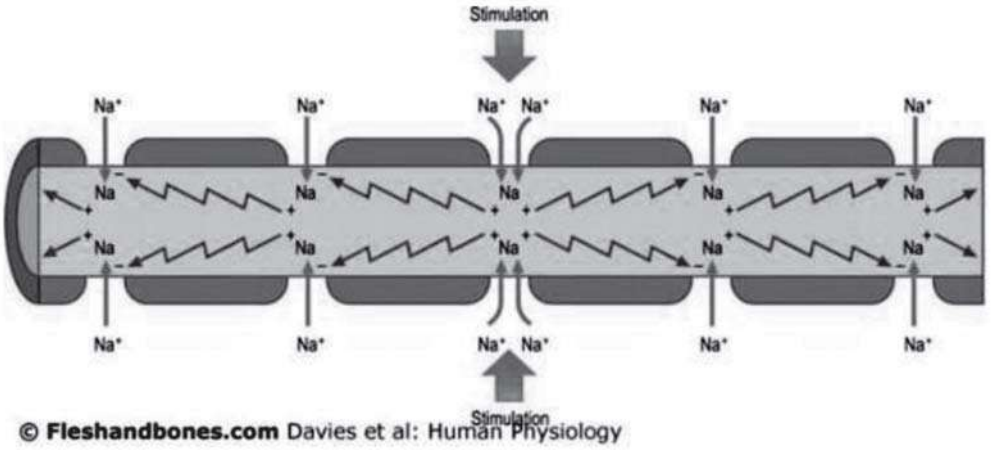


Diagrammatic representation of current flow around an impulse of axon in unmyelinated nerve fibre representing movements of positive charges. The straight arrow indicates direction of propagation

Propagation in myelinated nerve fibre : Saltatory conduction

The process of excitation and conduction in vertebrate myelinated nerve fibers is characterized by its discontinuous and saltatory features. The velocity at which an action potential propagates down an axon is limited by the speed at which ion channels open and close, and therefore, is slow compared to the physical conduction of electricity in a wire. In some neurons, action potentials must travel significant distances (>1 meter) to reach the effector junction. Given that rapid, coordinated function is dependent

on signals reaching the target quickly, vertebrates accelerate action potential propagation by employing saltatory conduction. In myelinated neurons, ion channels are located at the Nodes of Ranvier, and it is only at these sites where action potentials are regenerated. The myelin sheath provides an insulation that increases membrane capacitance and, thus, significantly diminishes decremental conduction. Therefore, current propagates from node to node in a manner more closely resembling a wire.



Synapse

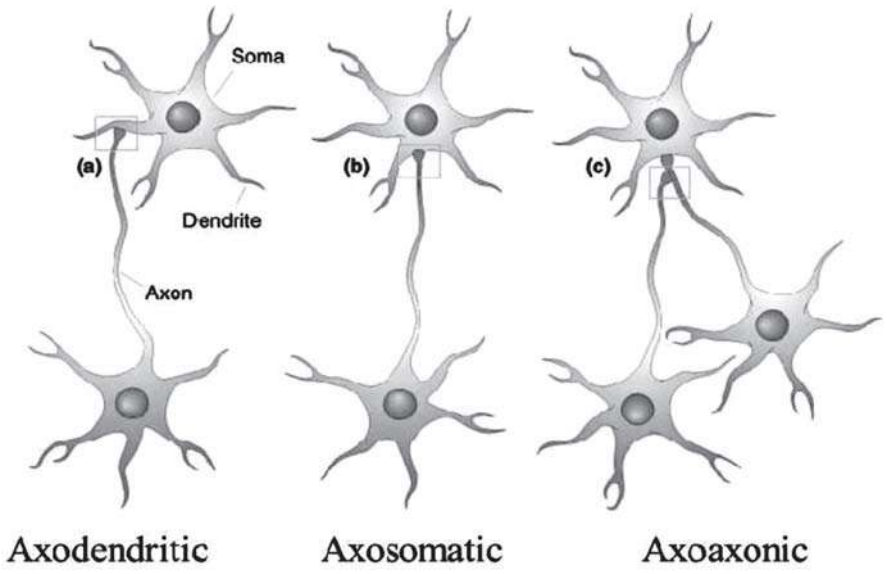
Synapse, also called neuronal junction, is the site of transmission of electric nerve impulses between two nerve cells (neurons) or between a neuron and a gland or muscle cell (effector). A synaptic connection between a neuron and a muscle cell is called a neuromuscular junction. It is the junctional region where one neuron ends and the other begins. Between the presynaptic and post-synaptic membranes a cleft of several nanometers is present. The transfer of infor-mation across a synaptic junction is called synaptic transmission. These transmissions are brought about either by chemical or by electrical or by both processes.

Classification of Synapse :

(a) According to structure :

On the basis of nature of connections between neurons, synapses have been classified into three types :

- Axodendritic synapse : Pertaining to the synaptic relationship of an axon with a dendrite of another neuron.
- Axosomatic synapse : The synaptic junction of an axon terminal of one nerve cell to the cell body of another nerve cell.
- Axoaxonic synapse : one between the axon of one neuron and the axon of another neuron is termed as axoaxonic synapse.



(c) According to function :

On the basis of how one impulse transverse the synapse

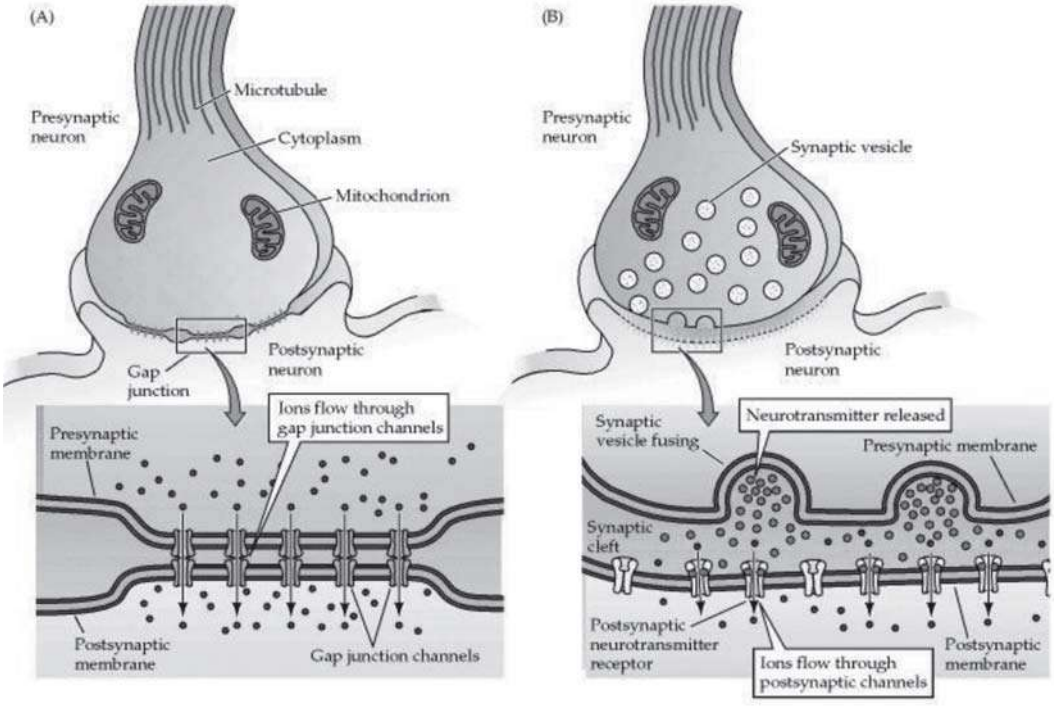
a) Electrical synapse :

Some synapses of mammals transmit stimuli by current flow across adjacent mem-branes. In this case the neurons are generally in much closer proximity and even in some instances pre-synaptic and postsynaptic mem-branes fused together.

b) Chemical synapse :

A chemical synapse between a motor neuron and a muscle cell is called a neuromuscular junction. Chemical synapses allow the neurons of the central nervous system to form interconnected neural circuits. They are thus crucial to the biological

computations that underlie perception and thought. They also provide the means through which the nervous system connects to and controls the other systems of the body. The human brain contains a huge number of chemical synapses, with young children having about 10,000 trillion synapses.

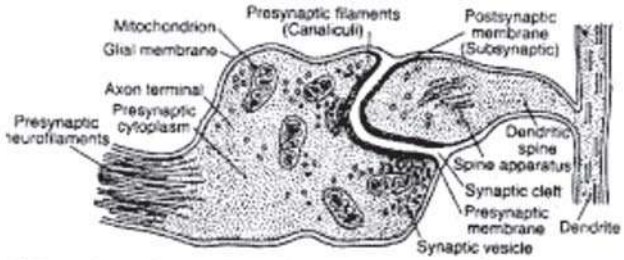


c) Electrochemical synapse :

In this synapse stimulus is transmitted both with the aid of electrons and neurotransmitter.

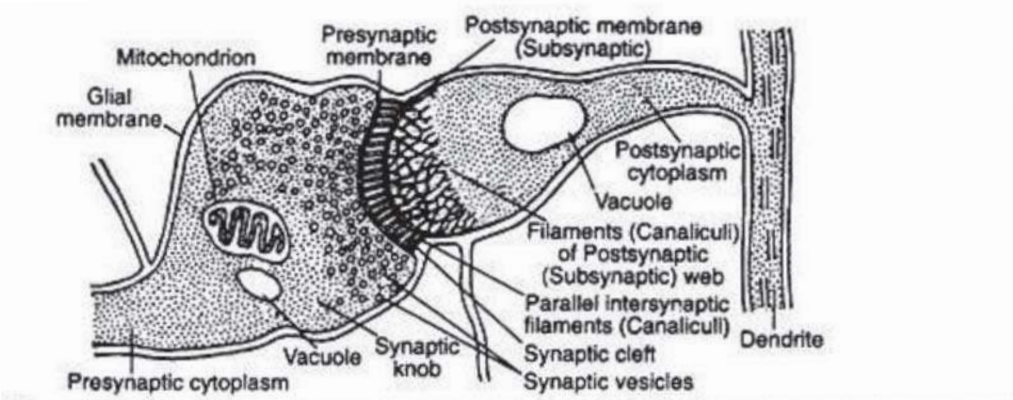
Structure of a Synapse

Electron microscopic studies have revealed that the axons of the presynaptic neurons end in the expanded terminals - the synaptic or terminal knobs or buttons. The membrane of the synaptic knob is the presynaptic membrane while that of the cell body is the postsynaptic membrane. Though there is intimate contact between the two membranes, they are separated by a gap-the synaptic cleft, measuring about 10-20 nm.



Electron microscopic representation of highly schematic enlargement of an axodendritic synapse

Thus, there is no physical con-tinuity in the cytoplasm of the presynaptic and postsynaptic neurons at the synapses. However, at some synapses, the two mem-branes show areas of closer proximity and the outer layers of the unit membranes of the pre- and postsynaptic membranes even fuse, forming gap junctions. In some synapses, the filaments form a web-like network on the postsynaptic membrane extending even into the cytoplasm of the postsynaptic neuron. This network is known as the post-synaptic web.



Electron microscopic representation of highly schematic enlargement of brain cortex (central synapse)

The cytoplasm of the termi-nal knobs contains mitochondria and synap-tic vesicles. The synaptic vesicles are spheri-cal or ovoid shaped with diameters ranging between 20-65 nm. A 4-5 nm thick unit mem-brane binds the vesicles. These vesicles are more concentrated towards the synaptic cleft.

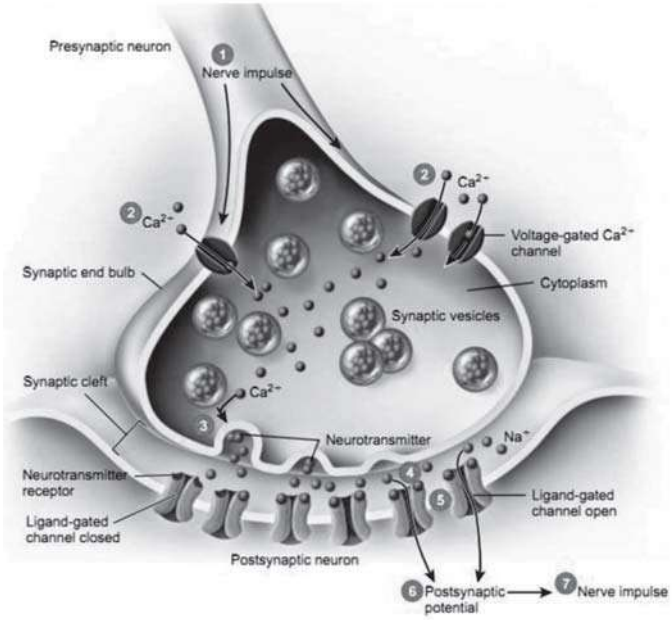
Process of Transmission of Nerve Impulse through Synapse :

The process can be described in two headings.

a. Releasing of chemicals from pre-synap-tic knob :

The transfer of nerve impulse across a synaptic junction is known as synaptic transmission. It is believed that the process is brought about by the release of chemical sub-stances at the synapse. The neuro-transmitter substances synthesized in the synaptic vesicles contain the excita-tory neurotransmitter substances that medi-ate transmission of nerve impulses from the presynaptic to postsynaptic neurons. The vesicles may be found on both sides of the synaptic junction, and in electrically transmitting neurons also terminal processes of the axons and stored in the synaptic vesicles.

On arrival of nerve action potential through the axon into the terminal knobs, the vesicles release the neuro-transmitter substance. Calcium ions are required for the release, and magnesium ions inhibit the process. After the release of the transmitter the vesicular membrane moves into the cell cytoplasm and is used to pack-age new transmitter substances synthesized.



b. Transmission of neurotransmitter from presynaptic ending to a postsynaptic membrane :

The neurotransmitter substances released by the presynaptic terminal diffuse across the synaptic cleft and bind to specific recep-tor sites on the postsynaptic membrane. In the vertebrate neuromuscular junction acetylcholine is released from 100 - 300 pre-synaptic sites and diffuses across a distance of less than 1mm.

Nature of neurotransmitter :

Acetylcholine is one of the major neuro-transmitter substances released at the synapse. Among other neurotransmitters, sympathin (norepinephrine) in the post-ganglionic fibres of the sympathetic nervous system is important. Dopamine, 5-hydroxytryptamine, -amino butyric acid (GABA), amino acids like alanine, glycine, aspartic acid and glutamic acid, peptides, histamine and prostaglandin are known to act as neuro-transmitters.

Generation of EPSP and IPSP :

The binding of the neurotransmitter to the receptor molecules is accompanied by alteration of the permeability of the post-synaptic membrane. Two types of alterations in the permeability are observed. The first is a general type in which the permeability of postsynaptic membrane to all types of ions brings about a depolarization of the mem-brane and excitatory postsynaptic potential (EPSP) is produced.

The second type increa-ses the permeability of the membrane to K+ and chloride ions causing hyper-polarization of the membrane and inhibitory postsynaptic potential (IPSP) is produced. If the synaptic potentials are great enough to produce suffi-ciently strong local currents, a spike is gene-rated in the appropriate region of the post-synaptic neuron.

Destruction of neurotransmitter substances :

The neurotransmitter substances are des-troyed quickly so that normal post-synaptic resting potentials are restored and the neuron may respond again to a new stimulus. Acetylcholine is destroyed by the enzyme acetylcholinesterase at the synaptic junc-tion and produces acetic acid and choline.

4.3.2. Structure and Function of Human Brain

The brain is an amazing three-pound organ that controls all functions of the body, interprets information from the outside world, and embodies the essence of the mind and soul. Intelligence, creativity, emotion, and memory are a few of the many things governed by the brain. Protected within the skull, the brain is composed of the cerebrum, cerebellum, and brainstem.

The brain receives information through our five senses: sight, smell, touch, taste, and hearing - often many at one time. It assembles the messages in a way that has meaning for us, and can store that information in our memory. The brain controls our thoughts, memory and speech, movement of the arms and legs, and the function of many organs within our body.

The central nervous system (CNS) is composed of the brain and spinal cord. The peripheral nervous system (PNS) is composed of spinal nerves that branch from the spinal cord and cranial nerves that branch from the brain.

Brain

The brain is composed of the cerebrum, cerebellum, and brainstem (Fig. 1).

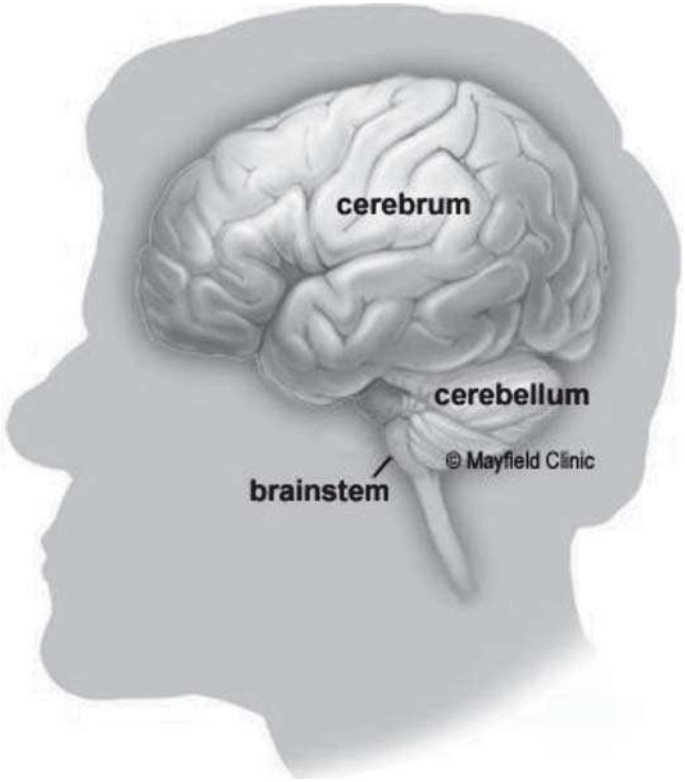


Figure: The brain has three main parts: the cerebrum, cerebellum and brainstem.

Cerebrum : is the largest part of the brain and is composed of right and left hemispheres. It performs higher functions like interpreting touch, vision and hearing, as well as speech, reasoning, emotions, learning, and fine control of movement.

Cerebellum : is located under the cerebrum. Its function is to coordinate muscle movements, maintain posture, and balance.

Brainstem : acts as a relay center connecting the cerebrum and cerebellum to the spinal cord. It performs many automatic functions such as breathing, heart rate, body temperature, wake and sleep cycles, digestion, sneezing, coughing, vomiting, and swallowing.

Right brain – left brain

The cerebrum is divided into two halves: the right and left hemispheres. They are joined by a bundle of fibers called the corpus callosum that transmits messages from one side to the other. Each hemisphere controls the opposite side of the body. If a stroke occurs on the right side of the brain, your left arm or leg may be weak or paralyzed.

Not all functions of the hemispheres are shared. In general, the left hemisphere controls speech, comprehension, arithmetic, and writing. The right hemisphere controls creativity, spatial ability, artistic, and musical skills. The left hemisphere is dominant in hand use and language in about 92% of people.

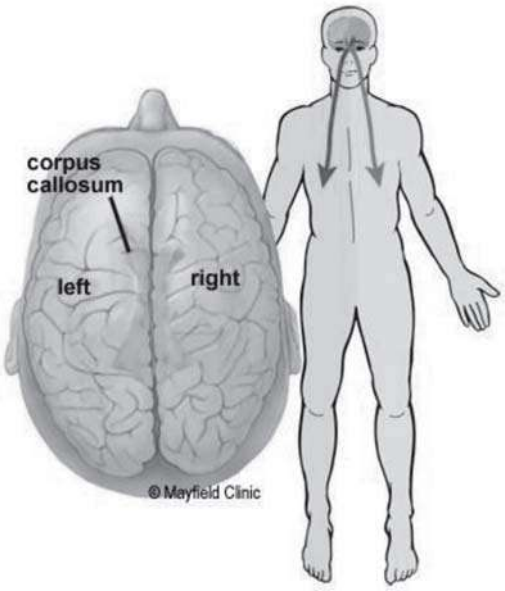
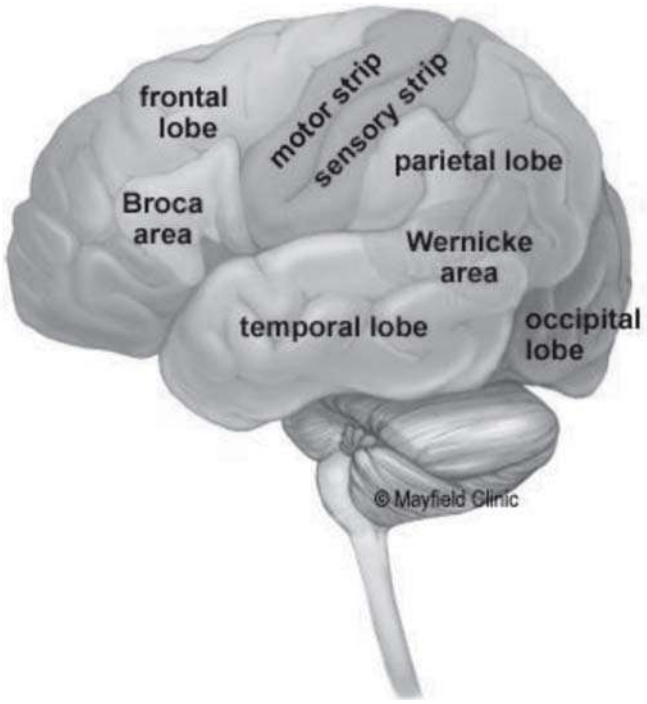


Figure: The cerebrum is divided into left and right hemispheres. The two sides are connected by the nerve fibers corpus callosum.

Lobes of the brain

The cerebral hemispheres have distinct fissures, which divide the brain into lobes. Each hemisphere has 4 lobes: frontal, temporal, parietal, and occipital. Each lobe may be divided, once again, into areas that serve very specific functions. It's important to understand that each lobe of the brain does not function alone. There are very complex relationships between the lobes of the brain and between the right and left hemispheres.



Figurure : The cerebrum is divided into four lobes: frontal, parietal, occipital and temporal.

Frontal lobe

- Personality, behavior, emotions
- Judgment, planning, problem solving
- Speech: speaking and writing (Broca's area)
- Body movement (motor strip)
- Intelligence, concentration, self-awareness

Parietal lobe

- Interprets language, words
- Sense of touch, pain, temperature (sensory strip)
- Interprets signals from vision, hearing, motor, sensory and memory
- Spatial and visual perception

Occipital lobe

- Interprets vision (color, light, movement)

Temporal lobe

- Understanding language (Wernicke's area)
- Memory
- Hearing
- Sequencing and organization

Language

In general, the left hemisphere of the brain is responsible for language and speech and is called the "dominant" hemisphere. The right hemisphere plays a large part in interpreting visual information and spatial processing. In about one third of people who are left-handed, speech function may be located on the right side of the brain. Left-handed people may need special testing to determine if their speech center is on the left or right side prior to any surgery in that area.

Aphasia is a disturbance of language affecting speech production, comprehension, reading or writing, due to brain injury - most commonly from stroke or trauma. The type of aphasia depends on the brain area damaged.

Broca's area: lies in the left frontal lobe. If this area is damaged, one may have difficulty moving the tongue or facial muscles to produce the sounds of speech. The person can still read and understand spoken language but has difficulty in speaking and writing (i.e. forming letters and words, doesn't write within lines) - called Broca's aphasia.

Wernicke's area: lies in the left temporal lobe. Damage to this area causes Wernicke's aphasia. The individual may speak in long sentences that have no meaning, add unnecessary words, and even create new words. They can make speech sounds, however they have difficulty understanding speech and are therefore unaware of their mistakes.

Cortex

The surface of the cerebrum is called the cortex. It has a folded appearance with hills and valleys. The cortex contains 16 billion neurons (the cerebellum has 70 billion = 86 billion total) that are arranged in specific layers. The nerve cell bodies color the cortex grey-brown giving it its name - gray matter (Fig. 4). Beneath the cortex are long nerve fibers (axons) that connect brain areas to each other - called white matter.

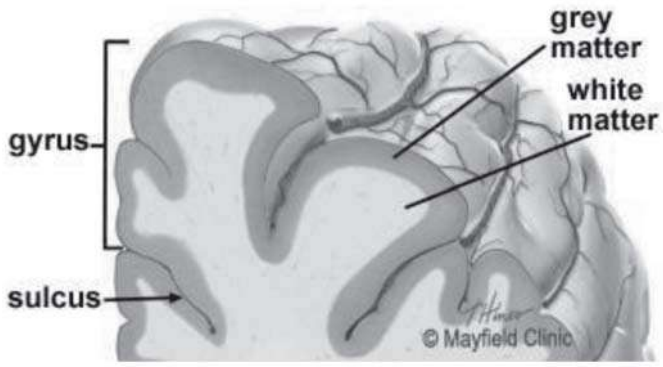


Figure: The cortex contains neurons (grey matter), which are interconnected to other brain areas by axons (white matter). The cortex has a folded appearance.
A fold is called a gyrus and the valley between is a sulcus.

The folding of the cortex increases the brain's surface area allowing more neurons to fit inside the skull and enabling higher functions. Each fold is called a gyrus, and each groove between folds is called a sulcus. There are names for the folds and grooves that help define specific brain regions.

Deep structures

Pathways called white matter tracts connect areas of the cortex to each other. Messages can travel from one gyrus to another, from one lobe to another, from one side of the brain to the other, and to structures deep in the brain.

Hypothalamus : is located in the floor of the third ventricle and is the master control of the autonomic system. It plays a role in controlling behaviors such as hunger, thirst, sleep, and sexual response. It also regulates body temperature, blood pressure, emotions, and secretion of hormones.

Pituitary gland : lies in a small pocket of bone at the skull base called the sella turcica. The pituitary gland is connected to the hypothalamus of the brain by the pituitary stalk. Known as the "master gland," it controls other endocrine glands in the body. It secretes hormones that control sexual development, promote bone and muscle growth, and respond to stress.

Pineal gland : is located behind the third ventricle. It helps regulate the body's internal clock and circadian rhythms by secreting melatonin. It has some role in sexual development.

Thalamus : serves as a relay station for almost all information that comes and goes to the cortex. It plays a role in pain sensation, attention, alertness and memory.

Basal ganglia : includes the caudate, putamen and globus pallidus. These nuclei work with the cerebellum to coordinate fine motions, such as fingertip movements.

Limbic system : is the center of our emotions, learning, and memory. Included in this system are the cingulate gyri, hypothalamus, amygdala (emotional reactions) and hippocampus (memory).

Memory

Memory is a complex process that includes three phases: encoding (deciding what information is important), storing, and recalling. Different areas of the brain are involved in different types of memory (Fig. 6). Your brain has to pay attention and rehearse in order for an event to move from short-term to long-term memory - called encoding.

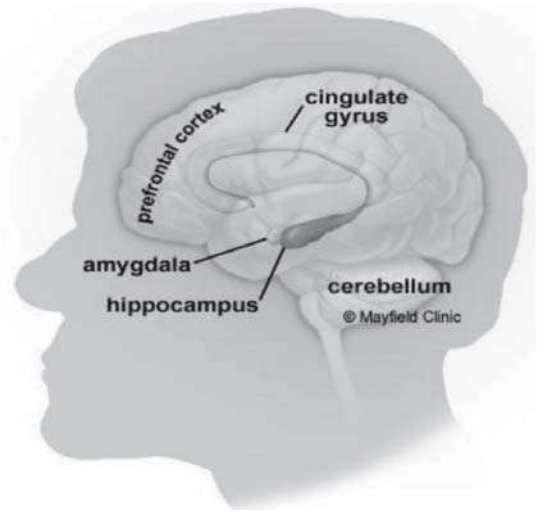


Figure : Structures of the limbic system involved in memory formation.

The prefrontal cortex holds recent events briefly in short-term memory. The hippocampus is responsible for encoding long-term memory.

- Short-term memory, also called working memory, occurs in the prefrontal cortex. It stores information for about one minute and its capacity is limited to about 7 items. For example, it enables you to dial a phone number someone just told you. It also intervenes during reading, to memorize the sentence you have just read, so that the next one makes sense.
- Long-term memory is processed in the hippocampus of the temporal lobe and

is activated when you want to memorize something for a longer time. This memory has unlimited content and duration capacity. It contains personal memories as well as facts and figures.

- Skill memory is processed in the cerebellum, which relays information to the basal ganglia. It stores automatic learned memories like tying a shoe, playing an instrument, or riding a bike.

Ventricles and cerebrospinal fluid

The brain has hollow fluid-filled cavities called ventricles. Inside the ventricles is a ribbon-like structure called the choroid plexus that makes clear colorless cerebrospinal fluid (CSF). CSF flows within and around the brain and spinal cord to help cushion it from injury. This circulating fluid is constantly being absorbed and replenished.

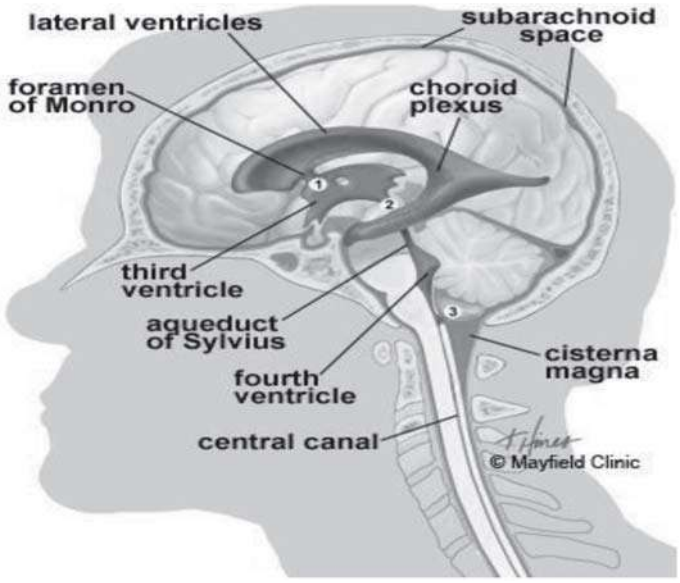


Figure: CSF is produced inside the ventricles deep within the brain. CSF fluid circulates inside the brain and spinal cord and then outside to the subarachnoid space. Common sites of obstruction : 1) foramen of Monro, 2) aqueduct of Sylvius, and 3) obex.

There are two ventricles deep within the cerebral hemispheres called the lateral ventricles. They both connect with the third ventricle through a separate opening called the foramen of Monro. The third ventricle connects with the fourth ventricle through a long narrow tube called the aqueduct of Sylvius. From the fourth ventricle, CSF flows into the subarachnoid space where it bathes and cushions the brain. CSF is recycled (or absorbed) by special structures in the superior sagittal sinus called arachnoid villi.

A balance is maintained between the amount of CSF that is absorbed and the amount that is produced. A disruption or blockage in the system can cause a buildup of CSF, which can cause enlargement of the ventricles (hydrocephalus) or cause a collection of fluid in the spinal cord (syringomyelia).

Cranial nerves

The brain communicates with the body through the spinal cord and twelve pairs of cranial nerves. Ten of the twelve pairs of cranial nerves that control hearing, eye movement, facial sensations, taste, swallowing and movement of the face, neck, shoulder and tongue muscles originate in the brainstem. The cranial nerves for smell and vision originate in the cerebrum.

The Roman numeral, name, and main function of the twelve cranial nerves :

Number	Name	Function
I	Olfactory	Smell
II	Optic	Sight
III	oculomotor	moves eye, pupil
IV	trochlear	moves eye
V	trigeminal	face sensation
VI	abducens	moves eye
VII	Facial	moves face, salivate
VIII	vestibulocochlear	hearing, balance
IX	glossopharyngeal	taste, swallow
X	Vagus	heart rate, digestion
XI	accessory	moves head
XII	hypoglossal	moves tongue

Meninges

The brain and spinal cord are covered and protected by three layers of tissue called meninges. From the outermost layer inward they are: the dura mater, arachnoid mater, and pia mater.

Dura mater : is a strong, thick membrane that closely lines the inside of the skull; its two layers, the periosteal and meningeal dura, are fused and separate only to form venous sinuses. The dura creates little folds or compartments. There are two special

dural folds, the falx and the tentorium. The flax separates the right and left hemispheres of the brain and the tentorium separates the cerebrum from the cerebellum.

Arachnoid mater : is a thin, web-like membrane that covers the entire brain. The arachnoid is made of elastic tissue. The space between the dura and arachnoid membranes is called the subdural space.

Pia mater : hugs the surface of the brain following its folds and grooves. The pia mater has many blood vessels that reach deep into the brain. The space between the arachnoid and pia is called the subarachnoid space. It is here where the cerebrospinal fluid bathes and cushions the brain.

4.3.3. Neuro-Endocrine System

The central neuroendocrine systems serve as an interface between the brain and many of the peripheral endocrine systems. This chapter discusses the hypothalamic control of anterior pituitary systems regulating stress, basal metabolism, growth, reproduction, and lactation. Each of these systems involves one or more hypothalamic releasing or inhibiting hormones, released from hypothalamic neurons that terminate in the portal capillary vasculature that projects from the median eminence at the base of the hypothalamus to the anterior pituitary gland. There, the hypothalamic hormones act upon subsets of anterior pituitary cells to regulate pituitary hormone release and downstream physiological functions. Other hypothalamic neuroendocrine cells control water/salt balance, and lactation/parturition, through the release of vasopressin and oxytocin from nerve terminals that arise in hypothalamus and project to the posterior pituitary gland. Together, these hypothalamic neuroendocrine functions enable the central nervous system to respond rapidly to internal or external environmental change, and to maintain a response through endocrine hormonal transducers.

The neuroendocrine system is composed of the hypothalamus and pituitary gland and is under the influence of neurotransmitters and neuropeptides that regulate hypothalamic releasing and hypothalamic release inhibiting hormones secreted into the blood vessels that connect the hypothalamus and pituitary gland. The release of these hypothalamic hormones influences the secretion of anterior pituitary hormones that subsequently regulate tissue function. The hypothalamus and pituitary gland have the capacity to detect humoral secretions (hormones secreted) from target tissues and adjust hormone production to maintain an optimal internal "milieu" appropriate for normal function. It is well-established that the neuroendocrine system has a critical role in integrating biological responses and influencing : (1) cellular protein synthesis and general metabolism through the release of growth hormone and thyroid-stimulating hormone (TSH), respectively, (2) reproductive function through the release of luteinizing

hormone (LH), follicle-stimulating hormone (FSH), prolactin, and oxytocin, and (3) plasma electrolytes and responses to stress through regulation of the hormones vasopressin (antidiuretic hormone, or ADH) and adrenocorticotropic (ACTH). In addition, the hypothalamus also has an important role in the integration of parasympathetic and sympathetic nervous system activity, and can thereby influence a wide variety of functions, including heart rate, blood pressure, vascular responses, and glucose metabolism. The hypothalamus has been implicated in the regulation of biological rhythms by its interactions with hypothalamic nuclei. More recently, the regulation of fat metabolism and food intake has been shown to be regulated through the hypothalamus by its response to the protein, leptin, and its synthesis of neuropeptide Y. It should be noted that the classification of hormones and their primary function presented here is an overly simplistic view of the neuroendocrine system, since critical interactions occur among these hormones that contribute to the coordinated regulation of cellular and tissue function.

Although the specific etiology of age-related changes in the neuroendocrine system is unknown, it has been proposed that cellular and molecular alterations in specific subpopulations of neurons within the hypothalamus and pituitary, and/or supporting structures within the brain, contribute to the decrease in tissue function. Some of the alterations may be related to loss of neurons or synapses, genetic errors, and/ or the production of free radicals, all of which lead to progressive aberrations in neurons and contribute to neuroendocrine aging. As a result, the neuroendocrine theory of aging is unique when compared to other theories of aging in that the neuroendocrine alterations are, in many cases, not considered the primary causative factors of biological aging, but rather are considered to be mediators of aging that are initiated by cellular changes in specific subpopulations of neurons or systems that closely interact with hypothalamic neurons.

Three classic examples of age-associated changes in neuroendocrine regulation, and the resulting consequences for tissue function, help emphasize the importance of this system in the development of the aging phenotype. First, with increasing age there is a decline in growth-hormone secretion that results in a decrease in insulin-like growth factor-1 (IGF-1) production in the liver and other tissues. The loss of these anabolic hormones contributes to the general decline in cellular protein synthesis, skeletal muscle mass, immune function, and cognitive ability in rodents, nonhuman primates, and humans. The decrease in growth-hormone release from the pituitary gland results from impaired release of growth-hormone-releasing hormone and increased release of somatostatin (an inhibitor of growth hormone) from hypothalamic neurons. Second, decreased secretion of gonadotropin-releasing hormone (GnRH) from hypothalamic neurons results in a decline in luteinizing hormone. This is the primary

factor in the loss of reproductive cycles in the female rodent, and, in conjunction with the loss of ovarian follicles, contributes to the decline in estrogen levels in women. These latter changes result in atrophy of secondary reproductive tissues and have been implicated in the post-menopausal loss of bone and cognitive function. Decreased GnRH secretion in the male also contributes to a decrease in LH and androgen levels and to the corresponding loss of skeletal muscle mass and reproductive function. Finally, increased secretion of ACTH and the adrenal hormone, cortisol, in response to stress have been reported to contribute to atrophy and/or loss of neurons, as well as age-related decline in cognitive function. These latter findings have contributed to the hypothesis that increased levels of glucocorticoids contribute to brain aging.

Although other mechanisms are possible, the alterations in the secretion of hypothalamic hormones with age have been traced to deficiencies in the secretion of brain neurotransmitters. For example, the activity of dopamine and norepinephrine decreases with age, and both acute and chronic procedures used to increase levels of these neurotransmitters in aged animals have been shown to restore some aspects of neuroendocrine function. Studies have shown an increase in growth hormone release and a restoration of some aspects of reproductive function in older animals in response to the L-Dopa, dopamine and norepinephrine precursor. These findings have led investigators to conclude that a decline in neurotransmitter activity is a contributing factor in the neuroendocrine decline that accompanies aging. Nevertheless, the possibility that interactions with other hypothalamic peptides, the loss of neurons, or intracellular changes within hypothalamic neurons contribute to the loss of function cannot be excluded. In fact, the inability of hypothalamic neurons to compensate for the age-related alterations in circulating levels of hormones supports the concept that the normal feedback mechanisms that occur within the hypothalamus are impaired in aged animals. Whether these altered feedback mechanisms are related to the deficiencies in neurotransmitters or result from other aberrations within the aging neuroendocrine system remain to be established. Nevertheless, deficits in the regulation of these critical hormonal systems contribute to deterioration of tissue function and undoubtedly are an important factor in age-related disease and disability.

4.4 Perception : Factors influencing Perception

4.4.1. Concept of Perception :

Everyday different stimuli around us will be stimulating our sense organs. Many of these stimuli are received by our sense organs and are converted into sensations.

These sensations are transmitted to the concerned parts of the brain. In turn the brain will interpret these sensations. It is only after such interpretation we understand what the stimulus is. Hence in understanding the world around us, attention occurs first, followed by sensation and finally interpretation by the brain.

In other words,Perception is the organization, identification, and interpretation of sensory information in order to represent and understand the environment. All perception involves signals in the nervous system, which in turn result from physical or chemical stimulation of the sense organs. It is not the passive receipt of these signals but is shaped by learning, memory, expectation, and attention.

According to Joseph Reitz; "Perception includes all those processes by which an individual receives information about his environment-seeing, hearing, feeling, tasting and smelling." According to B. V. H. Gilmer, "Perception is the process of becoming aware of situations, of adding meaningful associations to sensations." According to S. P. Robbins, perception can be defined as "the process by which individuals organize and interpret their sensory impressions in order to give meaning to their environments." Perception includes the 5 senses; touch, sight, taste, smell and sound. It also includes what is known as perception, a set of senses involving the ability to detect changes in body positions and movements. It also involves the- cognitive processes required to process information, such as recognizing the face of a friend or detecting a familiar perfume.

Principles of Perceptual Organization :

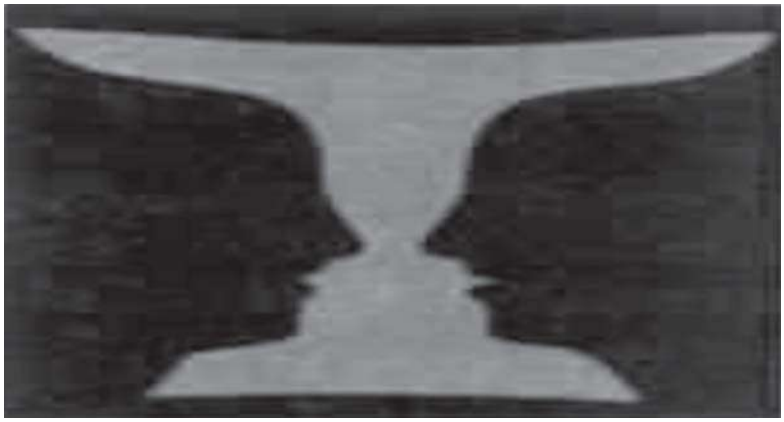
William James, an American psychologist has said if we understand the world as it appears to us, it will be a big blooming- buzzing confusion. Hence, we do not see the things as they appear, but we see them as we want, i.e. more meaningfully. In the perceptual process we select a particular stimulus with our attention and interpret it. In the same way whenever it is necessary many discrete stimuli in our visual field are organized into a form and perceived more meaningfully than they appear.

This phenomenon was well explained by Gestalt psychologists. They believed that the brain creates a coherent perceptual experience by perceiving a stimulus as a whole rather than perceiving discrete entities. This is more meaningfully stated in the gestalt principle as 'the whole is better than the sum total of its parts'. This is explained under many sub-principles of perception.

Figure-ground Relationship :

According to this principle any figure can be perceived more meaningfully in a background and that figure cannot be separated from that background. For example,

letters written with a white chalk piece are perceived clearly in the background of a blackboard.



In the above figure, two faces can be seen in the background of a white colour. So also the white background can be perceived as a vessel in the background of two faces.

4.4.2. Factors Affecting Perception :

There are individual differences in perceptual abilities. Two people may perceive the same stimulus differently.The factors affecting the perceptions of people are :

a. Perceptual learning :

Based on past experiences or any special training that we get, every one of us learns to emphasize some sensory inputs and to ignore others. For example, a person who has got training in some occupation like artistry or other skilled jobs can perform better than other untrained people. Experience is the best teacher for such perceptual skills.

For example, blind people identify the people by their voice or by sounds of their footsteps.

b. Mental set :

Set refers to preparedness or readiness to receive some sensory input. Such expectancy keeps the individual prepared with good attention and concentration. For example, when we are expecting the arrival of a train, we listen to its horn or sound even if there is a lot of noise disturbance.

c. Motives and needs :

Our motives and needs will definitely influence our perception. For example, a hungry person is motivated to recognize only the food items among other articles. His attention cannot be directed towards other things until his motive is satisfied.

d. Cognitive styles :

People are said to differ in the ways they characteristically process the information. Every individual will have his or her own way of understanding the situation. It is said that the people who are flexible will have good attention and they are less affected by interfering influences and to be less dominated by internal needs and motives than or people at the constricted end.

Importance of Perception

Learning is intrinsically related with perception. Learning- teaching is an indisputably psychological phenomenon dependent on perception. Perception is the process by which an organism detects and interprets information from the external world by means of the sensory receptors. It is our sensory experience of the world around us and involves both the recognition of environmental stimuli and actions in response to these stimuli. Through the perceptual process, we gain information about the properties and elements of the environment that are critical to our survival. The relevant importance may be list below as :

1. Perception is very important in understanding human behavior because every person perceives the world and approaches life problems differently. Whatever we see or feel is not necessarily the same as it really is. When we buy something, it is not because it is the best, but because we take it to be the best.
2. If people behave on the basis of their perception, we can predict their behavior in the changed circumstances by understanding their present perception of the environment. One person may be viewing the facts in one way which may be different from the facts as seen by another viewer.
3. With the help of perception, the needs of various people can be determined, because people's perception is influenced by their needs.
4. Perception is very important for the manager who wants to avoid making errors when dealing with people and events in the work setting. This problem is made more complicated by the fact that different people perceive the same situation differently. In order to deal with the subordinates effectively, the managers must understand their perceptions properly.
5. Perception can be important because it offers more than objective output; it ingests an observation and manufactures an altered reality enriched with previous experiences.

6. Perception builds character (not necessarily good or bad character) that defines different roles individuals fall into: the clown, the hypocrite, the self-righteous, the victim, etc.
7. It is vitally important if we want to get along with others to try to see things from their perspective or walk in their shoes for a while. If we walk in their shoes we will gain a new perspective about things and understand the other and also can love and help the other more appropriately.

Thus, for understanding human behavior, it is very important to understand their perception, that is, how they perceive the different situations. People's behavior is based on their perceptions of what reality is, not on reality itself. The world as it is perceived is the world that is important for understanding human behavior.

4.5 Cognition and Fundamental of Teaching

4.5.1. Concept of Cognition :

Cognition can be defined as "the act or process of knowing in the broadest sense; specifically, an intellectual process by which knowledge is gained from perception or ideas" (Webster's Dictionary). Cognition is central to the development of psychology as a scientific discipline. The establishment of Wilhelm Wundt's laboratory in 1879 to study human thought processes is often used as the beginning of modern psychology. Cognitive psychology is one of the major approaches within psychology and can be contrasted with the behavioral view (a focus on observable behavior), a psychoanalytic view (a focus on the unconscious), a humanistic view (a focus on personal growth and interpersonal relationships) and a social cognitive view (a focus on the social environment as it impacts personal qualities such as thinking and feeling.) An important distinction between the behavioral and cognitive or humanistic views is the importance of feedback. For behaviorists, the most important feedback comes in the form of the application of consequences from the environment. The cognitive, as well humanistic, would focus on the importance of internal feedback. The social cognitive view considers both types. Cunia (2005) provides an excellent overview of the cognitive theory applied to learning.

There are a variety of perspectives and emphases within cognitive psychology (Winn & Snyder, 1996) that are currently impacting educators' thinking about how to improve the teaching-learning process. The Information Processing approach focuses on the study of the structure and function of mental processing within specific contexts, environments, or ecologies. Benjamin Bloom and his colleagues developed the Taxonomy of the Cognitive Domain as a way to classify the variety of educational

objectives related to what and how human beings know. Researchers in the area of intelligence study how human beings learn from experience, reason well, remember important information, and adapt to the environment. Jean Piaget's theory of cognitive development describes the process and stages by which human beings develop the capacity to engage in abstract symbolic thought, one of the distinguishing features of human activity. Piaget's theory is often contrasted with the views of Jerome Bruner and Lev Vygotsky.

Several different areas of inquiry provide an opportunity to test out these different theories. For example, in the area of critical thinking researchers study how human beings apply cognitive processes to evaluating arguments (propositions) and making decisions. On the other hand, in the area of creative thinking researchers study how human beings generate ideas and alternatives that do not fit the "norm." These two areas are often contrasted as the difference between convergent thinking (thinking pattern used when the end result is to narrow and evaluate ideas) and divergent thinking (thinking pattern used to expand or develop new ideas). A similar comparison is between left-brain and right-brain orientations (i.e., brain lateralization dominance).

Metacognition is another area in cognition that draws from a number of different perspectives and is the study of how individuals develop knowledge about one's own cognitive system. Different study methods, such as SQ4R, provide information about how individuals can be most effective and efficient during the process of learning.

The materials available in this section provide a brief overview of these different approaches to the study of cognition. Joanne Ruttan provides an overview of some of the terminology used in the cognitive approach.

4.5.2. Cognition and teaching :

Cognition refers to mental activity including thinking, remembering, learning and using language. When we apply a cognitive approach to learning and teaching, we focus on the understanding of information and concepts. If we are able to understand the connections between concepts, break down information and rebuild with logical connections, then our intention of material and understanding will increase.

Since one of the main aims of education concerns student learning - which is an indisputably psychological phenomenon -it is a fact that the emerging research agenda of embodied cognition has much to offer educational practitioners, researchers, and policy-makers. Most would agree that in a broad sense education involves learning, comprises learners, is associated with the intentional activity of teaching, and is closely linked with clearly demarcated spatiotemporal educational settings, such as schools and universities. Taking into consideration some psychologists' interest in

learners and learningfrom the early twentieth-century onward, particularly within educational contexts (Thorndike, 1910), it is not too hard to see how cognitivist or behavioral schools of thought have in turn influenced theories of learning in educational discourse and practice. In the former case, cognitivist views of learning are basically concerned with internal mental factors that influence cognition, such as how we organize and reorganize our thinking as a result of our experiences in the world (Piaget, 1960), whereas in the latter case, behavioral accounts of learning are generally concerned with external factors, such as the identification of positive and negative reinforcements for certain types of behaviors (Skinner, 1968). The strengths and limitations of both these accounts are various; however, our intention at this juncture is to elucidate how each has failed to understand the role our embodiment (mind andbody) plays in cognition. Indeed, recent findings from research literature on learning and cognition from a diverse array of discipline areas, such as philosophy, psychology, linguistics, neuroscience, and computer science, have contributed to the view that traditional cognitivist accounts of the mind should be challenged because they exclude the close relationship that exists between mind and body that is more profound than initially considered (Shapiro , 2012)

However, the most important point here is to highlight how concrete experience can enhance and positively influence students' learning of scientific concepts (Kontra et al., 2015). Understandably, some teachers may want to know the reason or reasons why physical experience can enhance learning through instructional manipulatives. Indeed, embodied cognition is concerned with the interaction of the mind, body, and environment in explaining how knowledge is grounded in sensorimotor routines and experiences (Barsalou, 2008; Lakoff and Johnson, 1999). It is necessary to turn our attention to the educational implications of embodied cognition through some specific examples relevant to education.

An interesting starting point is a popular view of teaching and learning that argues mastery of discipline-specific knowledge should take place first, before it can be applied (Nathan, 2012). Such a view has been found to be deeply questionable because it tends to reinforce a formalisms-only mind-set toward learning and teaching that is rooted in dualistic views of knowledge that fallaciously associate intellectual work with the 'mind' and practical work with the 'body' - precisely the distinction that embodied cognition denies

When teachers are aware of gestures, they pick up information about their students' cognitive state that was not available in their speech (Novack and Goldin- Meadow, 2015). Observation of teachers revealed that they adopt different teaching strategies for students who display either discordance or concordance, relying more on mismatches of their own when explaining principles of certain phenomena to students who

mismatch. Similarly, Goldin-Meadow and Singer (2003) showed that teachers who display discordance benefit student learners because they expose them to a range of strategies in the gestural modality, thus teaching them how to 'think with gestures' about certain problems. Additional work on gesture reveals its importance in the acquisition of mathematical concepts.

We can hereby further discuss with a more detailed of the implication of cognition in learning teaching :

1. Teachers could and should look for concrete cues such as gestures-speech mismatches in order to identify students who have not fully comprehended the concept being taught. In response to these mismatches, teachers could increase the proportion of gesture-speech matches they use in teacher instruction, particularly when instructing students who are in transitional knowledge states.
2. The use of gestures in teacher instruction encourages learners to produce gestures of their own, or imitate the gestures that their teachers produce, which can enhance learning. In addition, encouraging students to gesture allows knowledge to be conveyed through their bodies that cannot verbally be communicated, but most importantly it demonstrates that the student is ready to learn.
3. Gestures can be classified into different categories, with each category defined by a particular function. For instance, gesturing is known to either alter the learners' responses and thoughts or lighten the cognitive load of the teacher or learner because it shifts the cognitive load from verbal to visuospatial stores, thus permitting the individual to work harder on the task and/or change their representation of the task in a manner that facilitates learning. Teachers who acquaint themselves with the distinct purposes of different kinds of gestures will be able 'read' and communicate more effectively with their students.
4. Embodiment offers either a causal route to more effective learning or a diagnostic tool for measuring conceptual understanding, and thus, educational 'best practice or practices' require that instructors keep abreast of current research in embodied education.

Education has turned to psychology to understand human learning and to guide best pedagogical practices. In this case, we argue that the emerging research agenda of embodied cognition has much to offer educational practitioners, researchers, and policymakers. Although embodied cognition is still in its infancy, the multidisciplinary and interdisciplinary nature of the literature provides some thought-provoking recommendations to enhance educational practices, which in turn can maximize the effectiveness of the teacher in bringing about student learning.

When we are aware of these mental actions, monitor the students and control our learning processes it is called metacognition, which varies from situation to situation, will greatly affect how individuals behave in a given situation. Understanding of language, or psycholinguistics. Is essential to our understanding of print and oral acquisition of knowledge. Comprehension and perception will allow individuals to interpret information. Lastly, the overall motivation.

In the context of education it has been shown that there is a significant, but rather modest positive relationship between Need for Cognition and academic achievement of students, evident especially in the later grades, with a lack of such a relationship in earlier grades (Luong et al., 2017). On the other hand, Need for Cognition strongly predicts the tendency to seek optional education programs which allow for enriched, deep learning (Meier et al., 2014). The choice of such programs is predicted by NC, while controlling for intelligence, academic self-concept, mastery or performance goals.

Teachers differ in the degree to which they put emphasis on content comprehension and deep learning. It has been shown that promotion of comprehension prevents intellectual helplessness of students. Promotion of comprehension is visible in requests of teachers for students to justify their answers, but in such a way that those requests allow for students' individual interpretations. Therefore these justifications are not just elaborate memorizations, but actually reflect student comprehension and mistakes inherent in early phases of learning. Promotion of comprehension is therefore similar to mastery-approach learning, oriented toward developing new skills and understanding. Positive correlation between mastery goals and Need for Cognition is very likely as well as a positive relationship between NC and deep learning (Cazan and Indreica, 2014). Therefore we can expect that teachers who place emphasis on deep learning, will also be likely to exert more effort in information search, as well as engage in mastery of new technological tools.

4.6 Summary

Learning is related to perception and cognition. Learning- teaching is an indisputably psychological phenomenon dependent on cognition. Perception and cognition are the mental processes that depend upon the central nervous system.

A nerve impulse is the relaying of a coded signal from a nerve cell to an effector (a muscle cell, a gland cell or another nerve cell) in response to a stimulus. Neurons are the structural and functional units of the nervous system which carry impulse. It majorly consists of cell body axons and dendrites. Propagation of nerve impulse slightly differs through myelinated and non-medullated nerves, though it follows a

typical neuro-chemical process while passing through the synapse by specific neurotransmitter.

The brain is an amazing three-pound organ that controls all functions of the body, interprets information from the outside world, and embodies the essence of the mind and soul. Intelligence, creativity, emotion, and memory are a few of the many things governed by the brain. Protected within the skull, the brain is composed of the cerebrum, cerebellum, and brainstem. The brain receives information through our five senses: sight, smell, touch, taste, and hearing - often many at one time. The central nervous system (CNS) is composed of the brain and spinal cord. The peripheral nervous system (PNS) is composed of spinal nerves that branch from the spinal cord and cranial nerves that branch from the brain. There are twelve cranial nerves that work in coordination with the brain. The central neuroendocrine systems serve as an interface between the brain and many of the peripheral endocrine systems. The neuroendocrine system is composed of the hypothalamus and pituitary gland and is under the influence of neurotransmitters and neuropeptides that regulate hypothalamic releasing and hypothalamic release inhibiting hormones secreted into the blood vessels that connect the hypothalamus and pituitary gland.

Perception is the organization, identification, and interpretation of sensory information in order to represent and understand the environment. All perception involves signals in the nervous system, which in turn result from physical or chemical stimulation of the sense organs. It is not the passive receipt of these signals but is shaped by learning, memory, expectation, and attention. Perceptual learning, mental set, Motives and needs and Cognitive styles influence perception. Learning- teaching is an indisputably psychological phenomenon dependent on perception.

Cognition can be defined as "the act or process of knowing in the broadest sense; specifically, an intellectual process by which knowledge is gained from perception or ideas". Cognition refers to mental activity including thinking, remembering, learning and using language. When we apply a cognitive approach to learning and teaching, we focus on the understanding of information and concepts. In the context of education, it has been shown that there is a significant, but rather modest positive relationship between Need for Cognition and academic achievement of students.

4.7 Self-Assessment Questions

1. Briefly describe the structure of Neuron. Mention the functions of neurons.
2. Explain the process of transmission of nerve impulse through synapse
3. Briefly describe the structure of human brain

4. Explain why the system is called a Neuro-endocrine system.
5. Define Synapse. Make a list of cranial nerves with name number & functions.
6. What is meant by perception? Analyze the Principles of Perceptual Organization:
7. Briefly explain the factors that influence perception.
8. How perception may be correlated with teaching and classroom management.
9. What is meant by Cognition? Give reason with how cognition is related to teaching.
10. Explain the implication of cognition in learning-teaching.

4.8 References

Barsalou, L. W. (2008). Grounded cognition. Annu. Rev. Psychol., 59, 617-645.;

Brooks, S.J.; Savov V; Allzén E; Benedict C; Fredriksson R; Schiöth HB. (February 2012). "Exposure to subliminal arousing stimuli induces robust activation in the amygdala, hippocampus, anterior cingulate, insular cortex and primary visual cortex: a systematic meta-analysis of fMRI studies". NeuroImage. 59 (3): 2962-2973. doi:10.1016/j.neuroimage.2011.09.077. PMID 22001789.

Cazan, A. M., &Indreica, S. E. (2014). Need for cognition and approaches to learning among university students. Procedia-Social and Behavioral Sciences, 127, 134-138.

Charlton T. Lewis, Charles Short, A Latin Dictionary, subl?mis". perseus.tufts.edu Accessed on…

Cunia, E. (2005). Cognitive learning theory. Principles of Instruction and Learning: A Web Quest. http://erincunia.com/portfolio/MSportfolio/ide621/ide621f03production/cognitive.htm Accessed on December 16, 2020.

Gilmer, B. V. H. (1961). Industrial psychology. McGraw-Hill.

Goldin? Meadow, S. (2009). How gesture promotes learning throughout childhood. Child development perspectives, 3(2), 106-111.

Griffin, J. E., and Ojeda, S. R. Textbook of Endocrine Physiology, 3d ed. New York: Oxford University Press, 1996.

Huitt, W. (2006). The cognitive system. Educational Psychology Interactive. Valdosta, GA: Valdosta State University. http://www.edpsycinteractive.org/topics/cognition/cogsys.html Accessed on [Accessed on November 26, 2020].

Kontra, C., Lyons, D. J., Fischer, S. M., &Beilock, S. L. (2015). Physical experience enhances science learning. Psychological science, 26(6), 737-749. https://doi.org/10.1177%2F0956797615569355.

Lakoff, G., Johnson, M., & Sowa, J. F. (1999). Review of Philosophy in the Flesh: The embodied mind and its challenge to Western thought. Computational Linguistics, 25(4).

Lodish H, Berk A, Zipursky SL, et al. Molecular Cell Biology. 4th edition. New York: W. H. Freeman; 2000. Section 21.1, Overview of Neuron Structure and Function. https://www.ncbi.nlm.nih.gov/books/NBK21535/[Accessed on December 02, 2020].

Loftus, Elizabeth F.; Klinger, Mark R. (June 1992). "Is the unconscious smart or dumb?". American Psychologist. 47 (6): 761-765. doi:10.1037/0003-066X.47.6.761. PMID 1616173.

Luong, C., Strobel, A., Wollschläger, R., Greiff, S., Vainikainen, M.-P., and Preckel,F. (2017). Need for cognition in children and adolescents: behavioral correlatesand relations to academic achievement and potential. Learn. Individ. Differ. 53,103-113. https://doi.org/10.1016/j.lindif.2016.10.019.

Meier, E., Vogl, K., and Preckel, F. (2014). Motivational characteristics of studentsin gifted classes: the pivotal role of need for cognition. Learn. Individ. Differ. 33,39-46. https://doi.org/10.1016/j.lindif.2014.04.006.

Perry, D. G., Kusel, S. J., & Perry, L. C. (1988). Victims of peer aggression. Developmental psychology, 24(6), 807.

Petty, R. E., & Cacioppo, J. T. (2016). Methodological choices have predictable consequences in replicating studies on motivation to think: Commentary on Ebersole et al.(2016). Journal of Experimental Social Psychology, 67, 86-87.

Piaget, J. (1960). The child's conception of the world. Patterson, N, J.: Littlefleld, Adams.

Robbins, S. P. (2009). OrganisationalBehaviour in Southern Africa. Pearson South Africa.

Shapiro, J. R., & Williams, A. M. (2012). The role of stereotype threats in undermining girls' and women's performance and interest in STEM fields. Sex roles, 66(3-4), 175-183.

Shapiro, L., & Stolz, S. A. (2019). Embodied cognition and its significance for education. Theory and Research in Education, 17(1), 19-39. https://doi.org/10.1177/1477878518822149

Skinner, B. F. (1968). Teaching science in high school-What is wrong?. Science, 159(3816), 704-710.

Tanas, L., Winkowska-Nowak, K., &Pobiega, K. (2020). The Importance of Teachers' Need for Cognition in Their Use of Technology in Mathematics Instruction. Frontiers in psychology, 11, 259. https://doi.org/10.3389/fpsyg.2020.00259

Thorndike, E. L. (1910). The contribution of psychology to education. Journal of Educational Psychology, 1(1), 5-12. https://doi.org/10.1037/h0070113.

Webster's Dictionary. Definition of "Cognition"

Winn, W., & Snyder, D. (1996). Cognitive Perspectives in Psychology. In D. H. Jonassen (Ed.), Handbook of Research for Educational Communications and Technology (pp. 112-142). New York: Macmillan. http://www.aect.org/edtech/ed1/pdf/05.pdf[Accessed on 26 November, 2021].

The Action Potential, Javier Cuevas, xPharm: The Comprehensive Pharmacology Reference, 2007, Pages 1-5, doi.org/10.1016/B978-008055232-3.60014-5

Introduction To General Zoology Vol 2, Chaki, Kundu & Sarkar, New Central Book Agency (P) Limited, 2008

https://www.biologyonline.com/dictionary/nerve-impulse

https://science.howstuffworks.com/life/inside-the-mind/human-brain/brain1.htm

https://www.cliffsnotes.com/study-guides/anatomy-and-physiology/nervous-tissue/transmission of-nerve-impulses

https://www.britannica.com/science/synapse

http://antranik.org/synaptic-transmission-by-somatic-motorneurons/

http://www.mayfieldclinic.com/pe-anatbrain.htm

brainfacts.org

thebrain.mcgill.ca

Unit–5 : Pedagogy in Practice

Structure

5.1 Objectives

In this Unit, we have tried to introduce you to the concepts and principles of Pedagogy from the perspective of problem-solving skill and knowledge construction. Flanders' Interaction Analysis System one of the major approaches of observing classroom behavior of learners addressed in this unit. Apart from behavioral issues in classroom situations the concept of teaching-instruction and their relationship is dealt with in this unit. After the end of this unit, you should be able to

- Comprehend the perspective of application of Pedagogy in learning teaching
- Explain how to inculcate the concept and principles about natural phenomena
- Innovate and justify the pedagogical model and strategy to develop problem solving ability
- Evolve pedagogical strategy to ensure knowledge construction
- Explain Flanders' Interaction Analysis System

- Differentiate Teaching and Instruction
- Differentiate direct and indirect instruction

5.2 Introduction

Pedagogy encompasses how teachers think and how teachers act, that is teacher thinking and teacher doing, the one impacting on the other, and with the third dimension of the visible, observable and measurable impact of the teachers' pedagogy on the learners. Therefore, these three aspects of teacher thinking, doing and their impact on student learning outcomes make up 'effective pedagogy'. The pedagogy impacted learning that is being reflected in terms of learner's behavior, hence analysis of learners' behavior is crucial in taking academic decisions. Furthermore, the instructional design is being governed by pedagogical principles. So in this unit we will introduce you with the concepts and principles of application of pedagogy, methodical approach of classroom observation and the different approach of instructional design.

5.3 Pedagogy and its application : Developing Concepts and Principles, Problem solving ability and Knowledge Construction ability.

5.3.1 Pedagogy : Developing Concepts and Principles

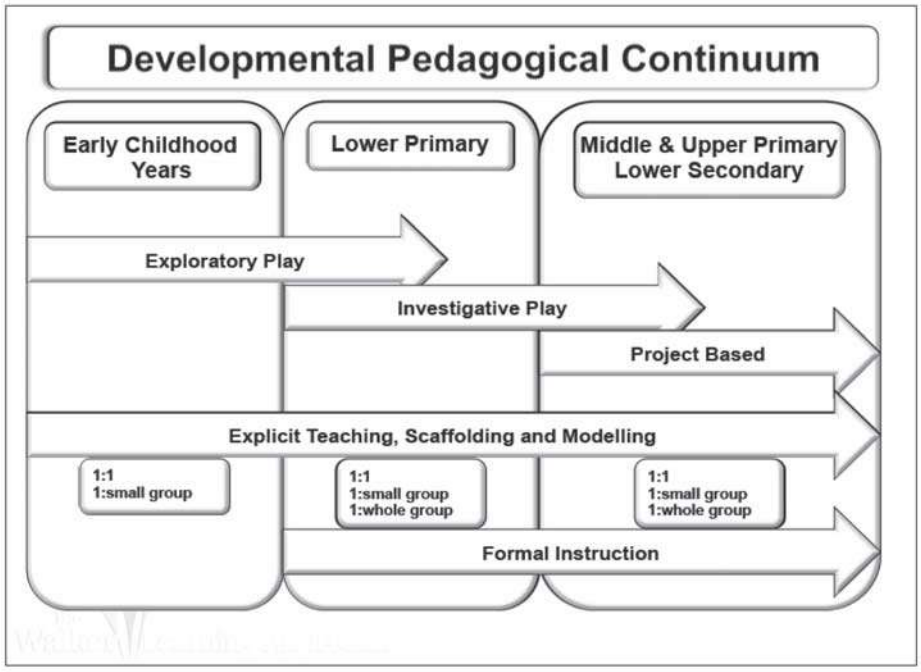
Quality teaching is defined as pedagogical practices that facilitate for diverse children their access to knowledge, activities and opportunities to advance their skills in ways that build on previous learning, assist in learning how to learn and provide a strong foundation for further learning in relation to the goals of the early childhood curriculum.

Developmental Pedagogical Continuum

Pedagogy naturally embeds all of the key values and philosophy in a developmentally and culturally appropriate way. The following figure illustrates the Developmental Pedagogical Continuum (Walker and Bass 2012) that demonstrates the changes in pedagogy to suit the developing child while maintaining the inclusion of all key values and practices consistent with the educational philosophy from child development perspectives(This is also influenced by children's contexts, environments and communities).

In the early childhood years children are engaged in exploratory play with no formal teaching, in the Prep-Year 2 children are engaged in investigative concrete hands-on experiences that are balanced and integrated with formal teaching. In the

Years 3 to 8 children are engaged in project-based learning that is child-centered and integrated with formal teaching.



Pedagogy is the act of teaching together with its attendant discourse. It is what one needs to know, and the skills one needs to command in order to make and justify the many different kinds of decisions of which teaching is constituted.For their pedagogy to fully reflect the research findings it is important for educators to:

Understand that intentional teaching/intentionality can occur in child initiated and educator directed learning experiences and intentional teaching can be planned or spontaneous (Mangione et al., 2011);

Understand that intentional teaching/intentionality is based in knowledge of children's cultural contexts gained through interactions with children and their families and children's skills, knowledge and understandings gained through interactions and assessment of children's learning and development (OECD, 2006);

Develop a range of teaching techniques including modelling, facilitating, questioning, telling and instruction, scaffolding and co-construction as described in McNaughton and Williams (2004). The skill of the educator lies in using these strategies, ensuring a balance of child and adult initiated experiences and in using assessment of children's learning in all types of experiences to plan for children's future learning;

Draw on their content knowledge to extend children's thinking and inquiry and to

support children's cultural identity and sense of contribution and belonging. When they do not have the necessary content knowledge to support children's learning educators need to access information with children, for example, through books, the internet and by asking community and family specialists (Farquhar, 2003);

How to ensure learning of Principles and Concepts :

A concept is the sum total of what we know about the object. It refers to a generalized idea about the objects, persons, events. It stands for a general class and not for a particular object, person, and event. It is a common name given on the basis of similarities or commonness found in different objects, persons, events. There are concepts of objects such as cat, tree, chair etc., and concepts of persons such as mother, Indian, Negro etc., and concepts of qualities such as honesty, goodness, and obedience. It is a mental disposition that helps in understanding the meaning of the objects or perceived earlier. In one sense, it is a general mental image of the objects / persons /events experienced or perceived earlier.

Concepts are very useful in recognizing, naming and identifying the objects / persons / events. Concept is the process of discrimination of the common features. Concert formation is the association of certain stimuli and responses. Concepts can be formed without the use of language. Concept is a part of the thought process. The concept is not common for all, different persons may have different concepts about the same object / events. A concept is not static, it is always changing. For example, first a child considers even the walls and doors to be living things. Then it understands they are nonliving, considers cars, buses and running objects to be alive. Later, it learns that only animals and plants are living.

Types of Concept Formation :

Direct Experience : It is the first type of concept formation, in which the learner develops concepts through direct experience with the particular objects / persons / events. It is developed from early childhood onwards. For example, the concept about cows.

Indirect Experience : Here the learner develops concepts through pictures, photos and reading descriptions, hearing from others. For example, the concept about Kangaroo. Faulty Concepts: The concepts or the general ideas we have about the objects, persons or events, are not always adequate and accurate. Small children have so many concepts that are quite erroneous and inadequate. For example, one's anxiety over the crossing of his way by a cat or one's feeling of hatred towards the person belonging to other caste or religion is the result of faulty concepts.

Process of Concept Formation: The process of concept formation has three important phases :

1. **Perception :** Experiences or learning in any form is the starting point of the process of concept formation. Our perceptions or imaginary experiences, formal or informal learning, provide opportunities for getting mental images of the objects, persons or events.

2. **Abstraction :** The mind analyses the perceived images and synthesizes what is common to all, neglecting what is particular. This process of observing similarities and commonness is named as abstraction.

3. **Generalization :** After making such observation in the form of abstraction for a number of times the child is able to generalize or form a general idea about the common properties of some objects or events. On account of this generalization, he will develop a concept about these things or events.

Later on, when he perceives a white or red cow he does not immediately call it a cow. He again makes an enquiry and comes to that these are cow For example, the child perceives a black cow at the first time and is told that it is a cow, he tries to form an idea about it. In the beginning the idea is very particular in nature. Concept Formation: In this way he compares and contrasts the similarities or dissimilarities of his mental images related to all perceived cows. In spite of the differences in colour, appearance etc., they are found to possess so many common properties or characteristics. He tries to compare the particular mental image of the previously perceived cow with the images he is having, at present, by perceiving white and red cows.

Students are challenged and supported to develop deep levels of thinking and application. Students are challenged to explore, question and engage with significant ideas and practices, so that they move beyond superficial understandings to develop higher order, flexible thinking. To support this, teaching sequences should be sustained and responsive, and explore ideas and practices. The following pedagogically appropriate sequence may be adopted with localization and improvisation.

A. Teaching sequences promote sustained learning that builds over time and emphasizes connections between ideas :

This component involves running with ideas for sufficient time to examine and use them in depth. This applies to the way key ideas are built across a learning sequence, but might also mean having sufficient time in teaching sessions to properly examine ideas. Links are made across learning. Link areas to demonstrate relevance and connectedness with what is being taught and how key ideas can apply to a range of situations.

B. Examples to illustrate the component

A teaching session on the conditions on the Western Front during World War I is followed by students reading extracts from soldiers' diary entries and letters and matching the 'first-hand' information found there with the main ideas from the previous teaching session. Students then record the main ideas from these two teaching sessions on an ongoing 'mind map' on World War I and make any links with previous subtopics.

C. The teacher promotes substantive discussion of ideas :

This component involves the teacher providing opportunities for students to talk together, discuss, argue and express opinions and alternative points of view. 'Substantive' refers to a focus on significant ideas, practices or issues that are meaningful to students, and that occur over a sufficient period of time to be effectively explored.

D. The teacher emphasizes the quality of learning with high expectations of achievement.

Teachers need to clearly signal an expectation that students will achieve at a high level and put in effort to produce quality work. This also involves teachers expressing and demonstrating confidence that students are capable of significant achievement. There is structured support to help students learn effectively so that this expectation does not occur in a vacuum.

E. The teacher uses strategies that challenge and support students to question and reflect :

This component involves the development of learning tasks designed to encourage and support students to move beyond their current understanding and think more deeply about ideas and practice. to promote depth and breadth of knowledge and understanding. Teachers emphasize engagement with ideas and practice through exploration.

F. The teacher uses strategies to develop investigating and problem solving skills

This component refers to higher order thinking skills that may be described in various ways, but encompass such things as interpretation, analysis, and application. It refers to the development of knowledge of ways of reasoning with evidence, particular to the learning area. These skills and knowledge are needed to successfully solve problems.

G. The teacher uses strategies to foster imagination and creativity

There has been considerable recent attention paid to lateral and creative thinking, as part of 'higher order' thinking and a 'thinking oriented curriculum'. Many schools have made this a major focus of learning and teaching policy. There are a number of

elements of 'creativity', including flexible and unusual thinking, and facility with generating ideas.

Developmentally appropriate pedagogy and instruction

Based on Vygotsky's zone of proximal development (ZPD) framework, the level of scaffolding from the teacher needs to accommodate the constraints set by a certain developmental stage. Guided participation in culturally valued activities can be applied effectively at lower grade levels (Rogoff et al 1995). Two major concepts are incorporated in guided participation: children's behaviour is guided by skilled members, and the children participate in activities that are culturally valued. Continuous informal assessment and diagnosis of individuals' ZPD are needed to provide adaptive instruction.

An illustration about adaptive instruction to improve self-regulated skills is given below.

Self-regulation skills development is one of the essential expected learning outcomes. Following the ZPD notion, a metaphor of self-regulation skills acquisition is "transition of other-regulation voices to self-regulation voices" in the reciprocal social interaction (Karasavvidis, Pieters and Plomp 2000). For example, at the beginning, the teacher may help students set goals for a task, provide strategies for the students to use, and prompt questions at every step triggering reflection. Gradually, the teacher leaves more space for the students to practice setting goals by asking questions like "How would you approach this problem?" which are also an informal assessment of students' self-regulated behavior. Instead of directly giving students the options of strategies, the teachers may ask the students to discuss and figure out strategies to use. The scaffolding from the teacher is gradually phased out as the students become more familiar with the task format. The teacher needs to have some standards in mind, and continuously measure students' ability in self-regulation skills, for example, with checklists. This helps the teacher measure the ZPD for providing adaptive instruction. This also provides implications for the alignment of pedagogy across grade levels. The interaction among different grade-level teachers may involve discussion about their experiences in providing scaffolding, students' ability in certain types of tasks, and so on. In this way, teachers may have a better idea of how these self-regulated skills develop and how to provide the appropriate amount of scaffolding. For example, the teacher may stop more often to ask the students to think reflectively and set goals for younger students.

Due to the different level of development on cognitive, social-cognitive and affective aspects, different age groups may differ in their self-regulation skills (Zimmerman 2002), which may be manifested in various contexts. In pre-school, children are able

to learn to control their actions and pay attention; at elementary school level, they may be required to control behaviours in various environments, learn to achieve goals, seek help, keep track of their work, and so on. After they get to the secondary level, more self-initiation and goal-oriented planning and monitoring are expected. A smooth transition across levels requires the teachers to have a clear idea of the ZDP at each level. Some questions the teachers can ask include: "what is the level of the Approaches to learning : Literature review

5.3.2. Pedagogy: Inculcation of Problem solving ability :

Problem-based learning

Problem-based learning (PBL) takes a student-centered approach, usually conducted within small groups. The teacher acts as a facilitator in problem-based learning. The required knowledge and skills are achieved in the process of solving authentic problems (Barrows 1996). Problem-based learning and inquiry-based learning are not mutually exclusive; rather, problem-based learning involves inquiry strategies. Some objectives of PBL are: (1) helping students develop cognitive flexibility; (2) practicing problem-solving skills as generic skills; (3) self-directed learning which requires high metacognitive ability; (4) practicing collaborative skills and communication skills; (5) increasing intrinsic motivation (Hmelo-Silver 2004).

Kolodner et al (2003) list a sequence of PBL classroom practices: (1) analyzing a problem scenario and facts in groups; (2) hypothesizing and explaining how to solve the problem; (3) dividing up the learning issues within the group, learning new knowledge which is needed to solve the problem; (4) returning to the problem; evaluating the hypotheses and learning issues; (5) repeating the learning cycle until the problem is successfully solved; (6) reflection and abstraction.

A meta-analysis study done by Dochy et al (2003) generates some interesting results showing the general effects of PBL on knowledge and skills, and factors moderating the effect of PBL.

1. The effect of PBL on skills could be positive across students' expertise levels; however, the effects of PBL on content knowledge might differ significantly based on students' expertise levels and knowledge base. Age-related characteristics such as students' metacognitive skills, social-cognitive and affective ability need to be addressed. For example, students with a low level of prior knowledge may be overwhelmed when asked to apply the newly encountered knowledge.

2. Although students might learn slightly fewer facts and less content knowledge in a PBL environment, the knowledge they acquire is much more elaborate; thus, students in PBL might perform better in retention and transfer of the knowledge in larger contexts.

3. Different forms of assessment might yield different results due to the complex structure of achievement; thus, a range of diversified assessment strategies are needed to gain a clear picture of students' knowledge and skills achievement in PBL.

The implementation of PBL is difficult especially in educational systems where transmissive instructional models are pervasive. For example, the teacher's role change, training model transitions, the constriction set by the classroom resources (for example, technology, students' experience in using technology) are major challenges in applying the PBL learning model in China (Tang and Shen 2005).

Some practical examples of implementation for two different age groups are given here.

1st and 2nd graders : Mathematics and language arts materials are embedded in a virtual environment with animated characters and interesting stories. Students are assigned roles in playing the game in which the mathematics and language questions are embedded. The scenario can be a practical problem which is age-appropriate. For example, a problem scenario could be: the password to a door is the total number of apples on two trees; a piggy needs to open the door in order to save his friend. To help them analyze the problem, the teacher can ask questions such as "If you want to get the password, what should you do?" Teacher-student reciprocal interaction with hints and support can help students reflect on their own learning state, set further goals and think reflectively after solving the problem. The progression of problems can gradually get more difficult.

In a curriculum teaching the respiratory system to middle school students, problem scenarios could be "diagnose various respiratory diseases" or "design an artificial respiratory system". Students can be divided into groups and each group assigned a problem such as "how is asthma caused?", "what happens to the respiration if the chest muscles are injured?" Each group is assigned a worksheet, which provides basic problem-solving sequences and guidelines. The students will be learning the mechanism of the respiratory system from the textbook, online resources, computer simulations, and will discuss how the knowledge can be used to solve the problems. The groups then present their work to the whole class. The whole class can work together to design an artificial respiratory system.

5.3.3. Pedagogy: Inculcation of knowledge construction solving ability :

Critical Thinking and Knowledge construction :

Critical thinking is a complex mental process involving paying attention to details, selecting relevant information, analyzing carefully and skeptically, making judgments, and metacognitive thinking such as reflection and higher-order planning (Cottrell

2005). It is an essential skill for both academic achievement and for dealing with various real-life problems. Critical thinking, as a generic thinking skill, is emphasized in a variety of content areas of curriculum planning documents across cultures, for example, the US (National Commission of Excellence in Education 1983), Hong Kong , Singapore (Sale, Leong and Lim 2001), Taiwan and Japan (Li 2010). Critical-thinking curriculums are relatively more difficult to implement in Asian classrooms because the teachers and students are more accustomed to the passive, trans missive, and knowledge-based model of learning; thus, more clear practice guidelines and more transitional time are needed for Asian learners to practice and acquire this essential skill (Van Der Mensbrugghe 2004).

Creative-thinking skills

Creative thinking refers to the ability to look at problems and situations in new ways, be able to generate new ideas and provide original, elaborative, and appropriate solutions (Sternberg 1999). Creative-thinking skills, as an essential ability for success, have been emphasized in the curriculum across cultures likewise, it is more difficult to implement in examination-driven and teacher-centred educational cultures. Instructional and learning models following the constructivist and student-centred approaches are more likely to help learners acquire and practice creative thinking. For example, in an e-learning setting in Malaysian schools (Sultan, Woods and Koo 2011), constructivist environments were found to reinforce creative thinking in addition to knowledge acquisition.

Cognitive apprenticeship model

A traditional definition of "apprenticeship" is that an expert transmits knowledge or skills to the learner by showing the process of the work. The expert shows a learner how to perform a task, and the learner may take a small portion of the work and gradually practice to take over all the steps. In a cognitive apprenticeship model, the cognitive and learning processes are explicitly demonstrated by the teacher for the students to practice various cognitive, metacognitive and socio-cultural skills (Collins 2006). In a cognitive apprenticeship model, students can be well scaffolded to tackle complex problems.

Collins, Brown and Holum (1991) list some general guidelines for applying the cognitive apprenticeship model in the classroom: (1) identify the processes of a task and explicitly demonstrate how the task can be accomplished; (2) ensure the abstract tasks are situated in authentic contexts; (3) diversify the contexts and articulate common underlying concepts to scaffold transfer.

Some practical methods for applying the cognitive apprenticeship model (Collins

2006) are: (1) the modelling method means the teacher explicitly showing how a task can be performed, for example, a science teacher can demonstrate and explain the steps for constructing an electric circuit in a science lab; (2) coaching refers to the teacher observing students perform a task and facilitating by providing hints, challenges and feedback, for example, the teacher can observe how the students edit a video and provide feedback and hints at key points; (3) articulation refers to the teacher encouraging students to verbalize their thinking process, which facilitates students' reflective thinking; (4) scaffolding refers to the teacher providing specific support for students' task accomplishment; (5) reflection refers to the teacher guiding students to compare their problem-solving steps to that of an expert's or their peers' to foster reflective thinking; (6) exploration refers to the teacher encouraging students to ask questions and solve their own problems. For example, the teacher can set general goals for a task and invite students to come up with sub-goals and questions regarding particular issues in the task. Based on the specific requirements of a discipline and students' age-related characteristics such as prior knowledge, metacognitive ability and communicating skills, the teacher may choose different methods

The development of social cognitive skills and affective skills

Social cognition development refers to the developing conceptions of the self, social reality, and relationships between people such as friendship, love, power, influence, and other related phenomena. Selman's five stages of perspective taking6 can demonstrate some age-related constraints of social cognitive skills. Knowledge about feelings and emotions, and the ability to make inferences about another person's emotional state develops with age. Age-related identity development may influence the effectiveness of certain instructional methods (Renninger 2009). The development of social cognitive skills and affective skills needs to be emphasized in all levels of education. Brain research evidence suggests that during childhood, children gradually become more self-conscious, attend to other people's thoughts and perspectives, and the adolescent years (middle school and high school years) are an especially sensitive and critical period of social cognitive and affective development (for example, Steinberg 2005; Choudhury, Blakemore and Charman 2006). For example, compared to adults, adolescents are more susceptible to peer influence, and compared to younger kids, adolescents are more likely to compare their own skills and competencies with their peers to form their identity. Competition and feedback from peers may affect their self-efficacy for the ones who haven't developed an individual interest in the learning content (Renninger 2009). To provide adaptive intervention, it is critical for middle school and high school teachers to understand how social relations direct students' motivation and academic goals, and affect academic outcomes. Increased self-awareness

and schools' emphasis on competition and social comparison is one of the major difficulties young adolescents face in the PYP-MYP transition. Interventions such as academic tracking to adapt to individual needs, and educational support initiatives to ensure the social emotional well-being of students may facilitate programme transition (Cowie de Arroyo 2011).

Group work for middle school students and elementary school students may need to be organized differently. At the lower elementary level, without sufficient guidance from the teachers it is difficult for children to conduct effective collaborative discussion since they may fail to consider others' perspectives. Middle school students are more likely to compare their own skills and competencies with their peers to form a self-representation; thus, group work that singles anyone out for peer assessment may have negative consequences, as students may be too engaged in comparing themselves to others (Renninger et al 2007).

The interaction between students' perceived identities and the sociocultural environment contributes to students' motivation and affects school performance (also see section 2.2). At different developmental stages, individuals may have different social identities, which are defined as one's knowledge of how he or she belongs to the social group. The process of social identity construction takes place by interacting with the members in that social group (Duveen 2007). According to Winther-Lindqvist (2012), the objectives, central activities and leading motives of a social environment establish students' perception of their membership in that group. School transition and a change of sociocultural environment usually involve major changes of objectives, cultures and values, and may involve the construction of new social identities. For example, when pre-school children transition to the elementary school, a sudden change of leading school activities and objectives (learning becomes the major objective) may cause a social identity crisis. Elementary students may form social identities in play-based participatory environments, and internalize the values and motives; in transition to middle school, they may face many changes and may need to form new social identities (for example, additional school responsibilities, and more self-regulated activities). The sudden change of learning cultures when students enter high school may also cause negative emotional consequences. This social identity concept can also help us understand why students might have identity crises when coming to a new culture. For example, for Asian students, solitary work and effort, good self-control and good academic performance are believed to be appreciated by the teacher and peers. When they are in a culture where collaborative interaction and inquiry are the central activities, they may not be accepted by their peers and they may then have a negative social identity (Chen, French and Schneider 2006), which could negatively affect their learning performance.

Adult guidance and negotiation on the central motives and activities are very important to help students construct new social identities (Winther-Lindqvist 2012). To create a sense of belonging requires the teacher to understand students' perception of self and social values through teacher-student conversation. The teacher needs to explicitly clarify the expectations and negotiate with the students about the desirable behaviours and actions to help them form positive social identities (Osterman 2000). Teachers need to understand students' social identities and corresponding learning behaviours. During staff meetings, teachers can share their experience to get a better image of students' potential identity crises in the context, especially when they newly transition to a higher grade level. Transitional support to clarify the expectations, objectives and central learning activities of a new programme may help the students form new identities much faster.

Learning how to learn

Self-regulated learning (SRL) is emphasized in all three IB programmes. SRL is a relatively domain-general skill. Key components of SRL include the ability to :

A. effectively choose and coordinate various cognitive strategies

B. set learning goals and direct one's own learning

C. commit to and engage in reaching the self-set goals (Boekaerts 1999).

At different developmental stages, students have different self-regulated learning skills. Teachers need to measure students' self-regulation abilities effectively in various contexts and provide adaptive intervention. Criterion-referenced informal assessment is very important to measure SRL skills since it is a complex construct with many dimensions and manifestations. The learning objectives, contextualized outcomes (SRL behaviours in specific contexts) and teachers' experience in providing intervention in the ZDP in each programme can be written in the articulation documents and shared with other programmes. Although the exhibition project in PYP, personal project in the MYP and extended essay and reflective theory of knowledge course in the DP are argued to practice students' research skills, metacognitive ability and learning skills, self-regulated learning needs to be emphasized beyond the small project level and needs to be developed consistently and continuously at the classroom and school levels. This could be an important issue for the IB worth further exploration.

5.4 Observation of Classroom Behaviour: Flanders' Interaction Analysis System

Classroom communication is a vital ingredient in the instructional and learning process in the school environment. It is as necessary as food is a prerequisite for

healthy growth. The quality and quantity of teacher-student interaction is a critical dimension of effective classroom teaching. The term 'interaction' implies an action - reaction or a mutual or reciprocal influence which may be between individuals, e.g. pupil - pupil; teacher-pupil in classroom setting or between materials and individuals or groups. An interaction is usually inferred from the behaviour of persons in the environment being studied. This behaviourmay be verbal or non-verbal and can be classified as being predominantly cognitive, affective or controlling in nature.

Interaction Analysis (IA) is an analytical observation scheme that gives an insight into what a teacher does while teaching. It is a systematic observation that represents a useful means of identifying, studying, classifying and measuring specific variables as the teacher and his/her students interact within instructional learning situations. It uses a system of categories to encode and quantify classroom behaviour of teachers and students.. The purpose of developing the observational system is that a teacher can be trained to use it for analyzing classroom behaviour; for planning, and studying his/her teaching activities in order to create more effective classroom learning. Interaction Analysis as an observational system captures the verbal behaviour of teachers and pupils that is directly related to the social-emotional climate of the classroom.

Interaction Analysis is a process of encoding and decoding the study pattern of teaching and learning. In the coding process, categories of classifying statements are established, a code symbol is assigned to each category and a trained analyst interprets the display of coded data and reconstructs the original events on the basis of the encoded data even though he may not have been present when data were collected. Interaction Analysis is used as a technique capturing qualitative and quantitative dimensions of teacher's verbal behaviour in the classroom.

The Basic Theoretical Assumptions of Interaction Analysis

The various theoretical assumptions, which are basic to every idea of interaction analysis, are as follows :

- In a normal classroom situation, it is verbal communication, which is predominant.
- Even though the use of spoken language might resort to non-verbal gestures in the classroom, verbal behaviour can be observed with higher reliability than most non-verbal behaviour and also it can reasonably serve as an adequate sample of the total behaviourin the classroom.
- We can normally assume that verbal statements of a teacher are consistent with his non-verbal gestures and, in fact, his total behaviour.
- The teacher exerts a great deal of influence on the pupils. Pupil's behaviour is affected to great extent by this type of teacher behaviour exhibited.

- The relation between students and teacher is a crucial factor in the teaching process and must be considered an important aspect of methodology.
- It has been established that social climate is related to productivity and to the quality of interpersonal relations. It has been proven that democratic atmosphere tends to keep work at a relatively high level even in the absence of the teacher.
- Children tend to be conscious of a warm acceptance of the teacher and to express greatest fondness for the democratic teacher.
- The role of classroom climate is crucial for the learning process.
- The teacher-classroom verbal behavior can be observed objectively by the use of observational technique designed to 'catch' the natural modes of behaviour, which will also permit the process of measurement with a minimum disturbance of normal activities of the group of individuals.
- Modification of teacher classroom behaviour through feedback is possible, though how much change can occur and more knowledge relating to the permanence of these changes will require further research.
- Teacher influence is expressed primarily through verbal statements. Non -verbal acts of influence do occur, but are not recorded through interaction analysis. The reasonableness of this assumption rests upon the assertion that the quality of the non-verbal acts is similar to the verbal acts; to assess verbal influence, therefore it is adequately a simple of all influences. (Niki, 2011)

Flanders Interaction Analysis Categories (FIAC)

The development of the original system of interaction analysis was primarily the work of Ned Flanders. Indeed, the system is often referred to as the Flanders System of Interaction Analysis (FIA) - an innovation which made possible significant insights into the analysis and improvement of instruction. Flanders' interaction analysis system is an observational tool used to classify the verbal behaviour of teachers and pupils as they interact in the classroom. Flanders' instrument was designed for observing only the verbal communication in the classroom and non-verbal gestures are not taken into account.

Flanders Interaction Analysis is a system of classroom interaction analysis which is concerned with verbal behaviour only, primarily because it can be observed with higher reliability than can non-verbal behaviour and more also, the assumption made that the verbal behaviour of an individual is an adequate sample of his total behaviour. Flanders Interaction Analysis Categories (FIAC) is a Ten Category System of communication which is said to be inclusive of all communication possibilities. There are seven categories used when the teacher is talking (Teacher talk) and two when the pupil is talking (Pupil talk) and tenth category is that of silence or confusion.

TEACHER TALK	**Indirect Influence (response)**	**Accepts feelings :** Accepts or clarifies an attitude of feeling tone of a pupil in a nonthreatening manner. Feeling may be positive or negative. Predicting and recalling feelings are included.
		Praise or Encourage : Praise or Encourage action or behavior. Jokes that release tension, but not at the expense of other individuals; nodding head saying or Umm...Hmm are included.
		Accepts or uses ideas of pupils. Clarifying building or developing ideas suggested by pupils. Teacher's extension of ideas of pupils are included, but the teacher can integrate more of his/ her own ideas into it.
		Ask question : Asking a question about content or procedure; based on the teacher idea with the intent that the pupil will answer.
		Lecturing : giving facts about opinion of content or procedures; expressing his / her own ideas' giving his / her own explanations or citing an authority other than the pupil.
	Direct Influence (initiation)	**Giving direction :** Direction order or commands to which pupils are expected to comply.
		Criticizing or Justifying authority : Statement intended to change pupil behavior from unacceptable to acceptable pattern. Bawling someone out; stating why the teacher is doing what he is doing; extreme self-reference.
PUPIL TALK	**Response**	**Pupil-talk-response :** Talk by pupil in response to teacher. Teacher initiates the contact or solicits the pupil's response or structures the situation. Freedom to express one's own ideas is limited.
	Initiation	**Pupil-talk-initiation :** Talk by pupil that they initiate. Expressing own ideas; initiating a new topic; freedom to develop opinion and a line of thought, like asking thoughts, like asking thoughtful questions; going beyond the existing structure.
SILENCE		**Silence or Confusions :** Pause; short periods of silence or confusion in which communication cannot be understood.

In this system, all teachers' statements are either indirect or direct. This classification gives central attention to the amount of freedom the teacher grants to the student. In a given situation therefore, a teacher has a choice. He can be direct, that is minimizing the freedom of the student to respond. His choice, consciously or unconsciously depends upon many factors among which are his perceptions of the situations and the goals of the particular learning situation. In order to make the total behaviour or total interaction in the classroom meaningful, the Flanders system also provides for the categorizing of students' talk. A third major section, that of silence or confusion is included in order to account for the time spent in behaviour other than that which can be classified as neither teacher nor student talk.

The Coding System

Flanders Interaction Analysis is a system for coding spontaneous verbal communication. Interaction could either be observed in a live classroom or in a tape recording. Whichever, the coding system is applied to analyze and improve the teacher - student interaction pattern. For every 3 seconds, the observer writes down the category number of the interaction he has observed. He records these numbers in sequence in a column. He will write approximately 20 numbers per minute and at the end of a period of time, he will have several long columns of numbers.

It is best for the observer to spend five to ten minutes getting oriented to the situation before he/she actually begins to categorize. This enables him to have a feeling for the total atmosphere in which the teacher and pupils are working. The observer stops classifying whenever the classroom activity is changed to avoid inappropriate coding. For example, when children are working on workbooks or doing silent reading. He will usually draw a line under the recorded numbers, make a note of the new activity and resume categorizing when the total class discussion continues. At all times, the observer notes the kind of class activity he is observing.

Information is plotted on a matrix for easy analysis and interpretation. The method of recording the sequences of events consists of entering the sequences of numbers into a 10-row by 10-column table. The generalized sequence of the teacher-pupil interaction can be examined readily in this matrix.

Adopting the guidelines for coding the verbal interactions of FIAC as expatiate in the preceding paragraph, the following observations are recorded and coded in 2.1; decoded in sequence of numbers in figure 1; the sequence of numbers entered into a 10-row by 10-column matrix in table 2; and patterns of interaction analyzed in table 3.

Precautions in the Use of Flanders Interaction Analysis

- The classroom encoding work should be done by an observer, who is familiar with the entire process and knows its limitations.
- It is an exploratory device therefore value judgments about good and bad teaching behaviors are to be avoided. This technique is not an evaluator device of classroom teaching.
- The questions regarding classroom teaching can only be answered by inspecting the matrix table. The observer cannot answer the question relating to teacher behaviour.
- A comparison between the two matrices can be reliable in terms of behaviour ratios, interaction variables and percentage of frequencies in each category and calls for frequency but value judgment is not possible.
- The accuracy of the observation depends upon the reliability of the observer. The classroom recording should be done after estimating the reliability of observers.
- At least two observers should code the classroom interaction for analyzing teaching and teacher behaviour

Limitations of Flanders Interaction Analysis

The system does not describe the totality of the classroom activity. Some behaviour is always overlooked and who is to say that the unrecorded aspects of the teaching act are more important than those recorded.

- Efforts to describe teaching are often interpreted as evaluation of the teaching act and of the teacher. While descriptions may be used as a basis of evaluation, judgment can be made only after additional value assumptions are identified and applied to data
- The system of interaction analysis is content-free. It is concerned primarily, with social skills of classroom management as expressed through verbal communication.
- It is costly and cumbersome and requires some form of automation in collecting and analyzing the raw data. It is not a finished research tool.
- Much of the inferential power of this system of interaction analysis comes from tabulating the data as a sequence of pairs in a 10 x 10 matrix. This is a time-consuming process.
- Once the high cost of tedious tabulation (electric computers) is under control

but the problem of training reliable observers and maintaining their reliability will still remain.

- Its potential as a research tool for a wide application to problems is to be explored.

Flanders Interaction Analysis as a technique for capturing the qualitative and quantitative dimensions of a teacher's verbal behavior. This technique can be adopted in the teaching learning process in our primary and secondary schools. Its adoption will impact positively on the social climate of learning that is actually lacking in most of the public primary and secondary schools. It has been established that social climate is related to productivity and to the quality of interpersonal relations. The improvement of pupils' interaction and social skills is an important aim of education and this juxtaposes Flanders' technique of Interaction Analysis as a bold step in the right direction to improve the quality of education.

Research using FIAC has suggested that the proportion of teacher statements that make use of ideas and opinions expressed by the pupils (sometimes called 'indirectness') is directly related to average class scores on constructive attitudes towards the teacher and the class work; and also, scores higher on achievement tests (Newman, 2001).Therefore, the appropriateness to train and retrain our teachers in Interaction Analysis (IA), a technique that gives insight into student-teacher exchanges, putting teachers in a better position to analyze and improve their teaching and enhance the social abilities of the students cannot be overemphasized.

Interaction Analysis as a technique should be applied to teacher education in a fashion that is consistent with a philosophy of personal inquiry. Inquiry in teacher education means translating understanding into action as part of the teaching process. It means experimenting with one's own behaviour, obtaining objective information about one's own behaviour, evaluating this information in terms of the teacher's role; in other words, attaining self-insight while acting like a teacher.

Flanders argued that established norms in schools are 80% teacher talk, 20% pupil talk and 11 - 12% silence. This is indeed, the prevalent scenario in our present educational system across the three levels of the primary, secondary and tertiary. There is an earnest need to reverse this scenario. In the traditional teaching situation, it is expected that the teacher shows more initiating behaviour than the pupils. The Pupil Initiation Ration (PIR) measures the proportion of pupil talk that is an act of initiation. A high PIR indicates that students show a lot of initiative introducing their own ideas into the classroom discourse. Interaction Analysis is linked to the personal relationship between teachers and pupils. There is an obvious interplay between the pedagogical authority of the teacher and his way to manage classroom interaction. The quality of

verbal interaction is establishing a rapport between the teacher and pupils wherein, the students could easily confide in the teacher their emotions, secrets, ideas and teething problems concerning learning. When a 'free talk' atmosphere is established within the school system, negative influences are the bane in our present educational system.

5.5 Teaching and Instruction, Instructional Design

5.5.1. Teaching and Instruction :

Since the inception of formal, classroom-based instruction, a fundamental aspect of teaching has been the way teachers arrange the classroom environment so students can interact and learn. The instructional strategies teachers use help shape learning environments and represent professional conceptions of learning and of the learner. Some strategies consider students empty vessels to be filled under the firm direction of the teacher; other strategies regard them as active participants learning through inquiry and problem solving-still others tell children they are social organisms learning through dialogue and interaction with others.

In the early twenty-first century there were many instructional strategies. Similarly, there are tactics used by teachers to support particular strategies. The following provides a framework for thinking about instructional strategies, and then provides descriptions of seven strategies used frequently by teachers.

A number of educators over the years, such as Barrie Bennett and Carol Rolheiser, have developed conceptual frameworks for thinking about instructional strategies. The frameworks most often include instructional organizers, instructional strategies, and tactics. Instructional organizers are at one end of a complexity continuum, and provide the "big ideas" that allow us to think about instructional practices. Examples of instructional organizers would be Howard Gardner's multiple intelligences or Benjamin Bloom's taxonomy for organizing instructional objectives. On the other end of the continuum are what are often labeled instructional tactics. These are specific, and for the most part, simple actions taken by teachers within the confines of particular teaching strategies. Asking questions, checking for student understanding, providing examples or visual representations, or examining both sides of an argument are examples of instructional tactics. Many tactics have grown out of the practices of experienced teachers. In the middle of the continuum are instructional strategies that involve a series of steps, are supported by theory and research, and have been designed to produce certain types of student learning. Examples of instructional strategies would include direct instruction, cooperative learning, and the others described later in this article.

Finally, some teaching strategies are tightly tied to the content of particular lessons. Pedagogical content knowledge is a term coined by Lee Shulman in 1987 to describe the relationship between content and strategy and to illustrate how what is being taught influences the way it is taught. For example, an English teacher teaching a Shakespearian tragedy would use different strategies than the biology teacher who is trying to help students understand photosynthesis. Similarly, a fourth-grade teacher would use different methods to teach reading, fractions, or the concept of scarcity.

An instructional strategy is intricately related to the learning environment. Classrooms are places where teachers and students interact within a highly interdependent environment. At particular times, some types of learning environments have been deemed more appropriate than others. Both formal and informal learning emanates from the particular environments that teachers create, and these are highly influenced by the strategies being used. For instance, lecturing creates a tightly structured learning environment where students are expected to listen, observe, and take notes. On the other hand, if the teacher divides students into cooperative learning groups, an environment is created where students are actively engaged and in charge of their own interactions.

Instruction was defined previously as "the purposeful direction of the learning process" and is one of the major teacher class activities (along with planning and management). Professional educators have developed a variety of models of instruction, each designed to produce classroom learning. Joyce, Weil, and Calhoun (2003) describe four categories of models of teaching/instruction (behavioral systems, information processing, personal development, and social interaction) that summarize the vast majority of instructional methods. Each model differs in the specific type or measure of learning that is targeted. Therefore, as we make decisions about "best educational practices" we must be certain that we connect recommended practices with specific desired outcomes. This point is often omitted; discussion of best practices then becomes a debate about desired outcomes rather than a discussion of how to achieve them.

Evolution of Concept of Instruction :

The instructional strategies used in the early twenty-first century began in antiquity. In ancient Greece, Socrates illustrated a questioning strategy intended to facilitate the learner's independent discovery of important truths. An instructional strategy similar to direct instruction was reported by Samuel Griswold Goodwich's account of teaching in a rural Connecticut school during the early eighteenth century.

As education extended beyond society's elite, educators became interested in instructional strategies that would accommodate large numbers of students in efficient

ways. One example, the Lancaster Method, popular in the early nineteenth century, consisted of gathering as many as a hundred students in one large room, sorting them into groups of similar abilities, and having monitors (teacher aides) guide pupil recitations from scripted lesson plans. Nineteenth-century instructional strategies were teacher centered, intended mainly to transmit basic information clearly. In the early part of the twentieth century, however, this emphasis started to shift. John Dewey and his disciples of Progressive education left a legacy of student-centered instructional methods aimed at helping students acquire higher-level thinking and problem-solving skills. Of particular importance was the project method that provided the intellectual heritage for such contemporary methods as cooperative learning, problem-based instruction and other approaches emphasizing active student learning and group interaction.

The early work of the Progressives, fueled later by new theories and research about learning by such eminent theorists as European psychologists Lev Vygotsky and Jean Piaget and Americans Jerome Bruner and Albert Bandura extended thinking in the profession about instructional strategies in the post-Sputnik reforms of the 1950s and 1960s. Cognitive psychology and constructivist perspectives produced instructional strategies such as discovery learning and inquiry teaching that were at the center of the curriculum reforms of that era, and the cooperative learning and problem-based strategies popular today became more widely known and used.

In the late 1960s Bruce Joyce began describing the various approaches to teaching that had been developed over the years. He developed a classification system to analyze each approach according to its theoretical basis, the learner outcomes it was designed to accomplish, and the teacher and student behaviors required to make the approach work. Joyce used the term model rather than teaching strategy to refer to a particular approach to instruction. In his initial work (Joyce and Weil, 1972) more than twenty models were identified. Joyce's conceptualization of the field was a significant contribution and has influenced greatly how educators have thought about instructional strategies worldwide.

Theoretical Paradigm :

Contemporary conceptions of instructional strategies acknowledge that the goals of schooling are complex and multifaceted, and that teachers need many approaches to meet varied learner outcomes for diverse populations of students. A single method is no longer adequate. Effective teachers select varied instructional strategies that accomplish varied learner outcomes that are both behavioral and cognitive.

Taxonomies for Categorizing Instructional Methods

Several taxonomies have been developed that categorize instructional strategies based on the strategy's theoretical underpinnings and on the type of learner outcomes that result from using the strategy. Joyce's taxonomy divided instructional models into four major families: information processing, behavioral, personal, and social. Behavioral strategies are designed to help students acquire basic information and skills. Information processing strategies help the learner process and use information and data. Social strategies help develop a sense of community and facilitate the learning of social skills. Personal methods emphasize the development of personal growth and awareness.

Others have made distinctions among strategies based on achieving learning outcomes most closely associated with behavioral theory as compared to those outcomes that stem from information processing, cognitive, and constructivist theories of learning. Still others have found the student-centered and teacher-centered categorization scheme useful for thinking about the relationship between student learning and instructional strategies. The seven strategies are categorized according to the degree of student versus teacher centeredness and the theoretical basis for the strategy.

Frequently Used Instructional Strategies

The rationale and theoretical background for each strategy is described in the table, along with the learner outcomes the strategy is intended to produce and the syntax and learning environment required to make the strategy effective. Syntax refers to the steps or phases through which a lesson progresses. Learning environment refers to the classroom context and required teacher and student behaviors. Each strategy described has been subjected to substantial research and evaluation and has been deemed highly effective. Positive effects, however, are sizable only if the strategy is implemented faithfully.

5.5.2. Teaching Strategy: Direct instruction

Direct instruction is a method for imparting basic knowledge or developing skills in a goal-directed, teacher-controlled environment. The teacher identifies clearly defined learning outcomes, transmits new information or demonstrates a skill, and provides guided practice. Direct instruction is designed to maximize academic learning time through a highly structured environment in which students are "on task" and experience high degrees of success.

Direct instruction has its roots in behaviorism. Behavioral theorists emphasize breaking behaviors and skills into component tasks and mastering each subcomponent. They emphasize the importance of modeling desired behavior and using feedback and reinforcement to guide students toward desired goals. The clearest empirical support

for direct instruction came from the teacher effectiveness research of the 1970s and 1980s. By studying the relationship between teaching behaviors and student achievement in classrooms, researchers concluded that direct instruction produced greater time-on-task and higher student achievement, particularly for the acquisition of basic information and skills.

Direct instruction can be used effectively to promote acquisition of knowledge that is well structured and that can be taught in a step-by-step fashion, such as parts of speech, the multiplication tables, or the capitals of the fifty states. It is also effective in teaching how to perform simple and complex skills such as how to subtract, read a map, or swing a golf club. Although direct instruction is widely used, it is not appropriate for teaching concepts and generalizations, higher-level thinking, inquiry, problem solving, group processes, or independent learning.

In general, a direct instruction lesson proceeds through five phases. Teachers begin the lesson with an orientation phase. The teacher clarifies the goals of the lesson, explains why the lesson is important, ties the lesson to previous lessons and students' prior knowledge, and motivates students. This establishes the students' mental set and prepares them for the lesson. This initial phase is followed by phase 2, presentation or demonstration. The teacher demonstrates the skill or presents new information. If a skill is being taught, each step must be identified and demonstrated accurately. If new information is being taught, the information must be well organized and logically presented. Effective teachers give multiple examples, provide accurate demonstrations, restate the information often, and use visual models or illustrations.

The third phase is guided practice. The teacher structures the initial practice by walking the students through, step-by-step, and giving feedback on correct and incorrect responses. When students understand, the teacher moves to guided practice in which students work independently while the teacher monitors student work and gives individual feedback. Guided practice is most effective in short increments repeated over time. At the end of guided practice, phase 4 checks for understanding and provides feedback, informally or formally, verbally or in writing. The most common tactic in this phase of the lesson is teacher questioning, but assessing independent work, giving a quiz, or observing a live or taped performance may also be appropriate. Feedback must be given as soon as possible after practice and be specific and focused on behavior.

The final phase of a direct instruction lesson is extended practice. Extended practice reinforces the knowledge or skill. It can be accomplished through seatwork or homework, but should only be given when students are at or near mastery and timely feedback can be given. Extended practice over time increases retention, transfer, and

automaticity. The learning environment in a direct instruction lesson is highly structured by the teacher. Students are expected to be careful listeners and keen observers

Teaching strategies unit objective is to :

1. Create or select teaching methods, learning activities, and instructional materials or other resources that are appropriate for the students and that are aligned with the goals for the lesson.

Direct Instruction lesson objectives are to :

1. Describe and explain the features and purposes of direct instruction.
2. Describe and be able to follow guidelines for the effective use of different methods of direct instruction (such as presentations, questions, practice, drills, reviews, guided practice, and homework)

Direct Instruction

Have students explain the difference between direct and indirect teaching strategies

Teaching strategy continuum

1. Use continuum, with direct on one end, indirect on other. Have students draw 3 continuums: (1) enjoy most as a learner (2) learn best (3) might prefer teaching using. Have them put "x" on each continuum, committing to which category of strategy they enjoy most as a student; then repeat, but ask them from which category of strategies that think they learn best. Now, have them stand on a continuum in the room, and see what the spread is.
2. Discussion: of where they place themselves on each continuum, why, and if there were differences, why. Specific questions:
3. For those of you who enjoy learning most from direct instruction, why? From indirect? Why?
4. How many had differences between the category they enjoy most and the category from which they learn best? Why these differences? For others, why not different?
5. How many had differences between the category they enjoy most and the category from which they might prefer teaching most? Why?
6. What are the implications of this discussion for you as a teacher? (discuss in small groups)

Key steps in teacher directed lesson :

Barak Rosenshine's Explicit Teaching model :

1. daily review

2. present new material
3. conduct guided practice
4. provide feedback and correctives
5. conduct independent practice
6. weekly and monthly review

Madeline Hunter's Instructional Theory into Practice (ITIP) or Elements of Lesson Design :

1. anticipatory set
2. objective and purpose
3. instructional input
4. modeling
5. monitoring to check for student understanding
6. guided practice
7. independent practice

Homework :

For Monday : Review the different direct teaching strategies described in Chapter 7 and consider ways in which you might use each to teach your subject. Read chapter 8, Indirect Instructional Strategies, and also consider ways to use it in your area.

Begin developing a matrix of teaching strategies, with the first section being on Direct Strategies and the second on Indirect. Under each section, list as many strategies that you can find, and for each give examples of when and how you might use these for teaching middle and secondary students.

Peer teaching strategies : Lecture/presentation, Demonstration using deductive strategies and questioning, Recitation, Concept attainment; Inquiry problem solving, whole class discussion.

5.5.3. Teaching Strategies: Indirect Instruction

Consider indirect instruction for teaching concepts, inquiry, and problem solving. An old adage says: "Tell me and I forget, show me and I remember, involve me and I understand." The teaching of concepts, inquiry, and problem solving are different forms of indirect instruction that actively involve your learners in seeking resolutions to questions and issues while they construct new knowledge. Indirect instruction is an approach to teaching and learning in which (1) the process is inquiry, (2) the content involves concepts, and (3) the context is a problem.

These three ideas are brought together in special ways in the indirect instruction

model. This chapter presents teaching strategies you can use to compose your own indirect teaching approach that asks your learners to share the excitement of becoming actively involved in their own learning and contributing new knowledge to solve real-world problems. We begin by looking into two classrooms, one in which Tim Robbins is teaching a lesson with the direct instruction model and the other in which Kay Greer is teaching the same lesson with the indirect instruction model.

Examples of Problem Solving, Inquiry, and Concept Attainment Strategies

Generalization is a process by which the learner responds in a similar manner to different stimuli, thereby increasing the range of instances to which particular facts, rules, and sequences apply.

Discrimination is a process by which the learner selectively restricts the acceptable range of instances by eliminating things that may look like the concept but differ from it on critical dimensions.

The processes of generalization and discrimination together help students classify different-appearing stimuli into the same categories on the basis of essential attributes. Essential attributes act as magnets, drawing together all instances of a concept without the learner having to see or memorize all instances of it.

The following are instructional strategies of the indirect model:

- Use of advance organizers
- Conceptual movement-inductive and deductive
- Use of examples and non-examples
- Use of questions to guide search and discovery
- Use of student ideas
- Student self-evaluation
- Use of group discussion

Content Organization

An advanced organizer gives learners a conceptual preview of what is to come and helps them store, label, and package content for retention and later use.

Three approaches to organizing content and composing advanced organizers are the concept learning, inquiry, and problem-solving approaches.

Conceptual Movement : Induction and Deduction

Induction starts with a specific observation of a limited set of data and ends with a generalization about a much broader context.

Deduction proceeds from principles or generalizations to their application in specific contexts.

Using Examples and Non-examples

Providing examples and non-examples helps define the essential and nonessential attributes needed for making accurate generalizations.

Using examples and non-examples includes the following steps :

- Providing more than a single example
- Using examples that vary in ways that are irrelevant to the concept being defined
- Using non-examples that also include relevant dimensions of the concept
- Explaining why non-examples have some of the same characteristics as examples

The Use of Questions to Guide Search and Discovery

In indirect instruction, the role of questions is to guide students into discovering new dimensions of a problem or new ways of resolving a dilemma.

Some uses of questions during indirect instruction include the following:

- Refocusing
- Presenting contradictions to be resolved
- Probing for deeper, more thorough responses
- Extending the discussion to new areas
- Passing responsibility to the class

Learner Experience and Use of Student Ideas

Student ideas can be used to heighten student interest, to organize subject content around student problems, to tailor feedback to fit individual students, and to encourage positive attitudes toward the subject. Because these goals should not become ends unto themselves, there should be a plan and structure for using student ideas in the context of strategies to promote problem solving, inquiry, and concept learning.

Student-centered learning, sometimes called unguided discovery learning, allows the student to select both the form and substance of the learning experience. This is appropriate in the context of independently conducted experiments, research projects, science fair projects, and demonstrations. However, the preorganization of content is always necessary to ensure that the use of student ideas promotes the goals of the curriculum.

Student Self-Evaluation

Self-evaluation of student responses occurs during indirect instruction when you give students the opportunity to reason out their answers so you and other students can suggest needed changes. Students can most easily conduct self-evaluation in the context of student-to-student-to-teacher exchanges, wherein you encourage students to comment on and consider the accuracy of their own and each other's responses.

Use of Group Discussion

A group discussion involves student exchanges with successive interactions among large numbers of students. During these exchanges, you may intervene only occasionally to review and summarize, or you may schedule periodic interaction to evaluate each group's progress and to redirect the discussion when necessary.

The best topics for discussion include those that are not formally structured by texts and workbooks and for which a high degree of consensus among your students does not yet exist.

Moderating functions during discussion include the following :

- Orient students to the objective of the discussion.
- Provide new or more accurate information that may be needed.
- Review, summarize, and relate opinions and facts.
- Redirect the flow of information and ideas back to the objective of the discussion.

Comment :

Direct and indirect instruction is often used together, even within the same lesson, and you should not adopt one model to the exclusion of the other. Each contains a set of strategies that can compose an efficient and effective method for the teaching of facts, rules, and sequences and to solve problems, inquire, and learn concepts.

Comparing Direct and Indirect Instruction

Indirect instruction is an approach to teaching and learning in which concepts, patterns, and abstractions are taught in the context of strategies that emphasize concept learning, inquiry, and problem solving.

In indirect instruction, the learner acquires information by transforming stimulus material into a response that requires the learner to rearrange and elaborate on the stimulus material.

Direct Instruction	Indirect Instruction

● Teachers tell the students the concept or skill to be learned and then lead them through instructional activities designed to result in student learning.
● Based on behavioristic learning principles (e.g. getting students' attention, reinforcing correct responses, providing corrective feedback, practicing correct responses)
● Higher use of academic learning time (time on task)
● Teacher structured lessons, following a clear, sequential approach, with the teacher in control of the content, activities, and lesson pacing.
● Usually used to teach new skills or concepts (often use deductive methods).
● Academically focused, with the teacher stating the goals for the lesson.
● Teacher monitors student understanding and provides feedback.
● 4 components :
  ● clearly articulated goals
  ● teacher-directed instruction
  ● careful monitoring of student outcomes
  ● use of clear classroom organization and management strategies
● Key models : Rosenshine's Explicit Teaching & Hunter's Instructional Theory Into Practice (ITIP) or Elements of Lesson Design
	● Limited teacher direction, with emphasis on students co-creating their learning with the teacher as a facilitator of their learning.
	● May use social instructional approaches (learning with other students) or students working independently.
	● Often based on constructivist principles where students create meaning through active engagement and investigation. Constructivism promotes (a) the student point-of-view (b) teacher-student or student-student interaction (c) questioning to promote student thought (d) nurturing of student reflection rather than emphasis on a single correct answer.
	● Tends to use more inductive methods (leading students to discover concepts).

5.5.4. Effective Instructional Strategies :

Simulation : Simulation involves students playing roles in simulated situations in order to learn skills and concepts transferable to "real life." Students make decisions and learn from successes and failures. Simulations enable the learning of complex concepts or mastery of dangerous tasks in more simple and safe environments.

Simulations include hands-on games such as Monopoly (real estate), social-political-economic role-playing or problem solving, software games and experiments (chemical changes), and simulators (driving a car or landing a plane). Although some simulations are done individually (such as driving), others occur in groups.

Simulation is grounded in a branch of behavioral psychology called cybernetics, which holds the perspective that learning occurs in an environment in which the learner receives immediate feedback, experiences the consequences of behavior, and continually self-corrects until mastery occurs. When learning to land a plane in a flight simulator, for example, the "pilot" receives feedback on the speed, height, and angle of descent, and corrects (or under-or over-corrects) until the plane "lands" or "crashes." With continued practice, corrective behaviors become automatic until the "pilot" lands the plane safely each time.

Simulations are effective for teaching complex skills or concepts. Simulations can be used to practice skills such as driving, to teach concepts such as how political, social, and economic systems work, or to discern scientific principles through simulated experiments. Additional outcomes include problem solving, decision making, cause-effect relationships, cooperation or competition, and independent learning. Simulations are not effective for teaching large amounts of fact-based information.

Presentation using advance organizers : Presentation (or lecture) is among the most commonly used strategies for knowledge acquisition and retention. But presentation is more than teachers talking. An effective presentation requires a highly structured environment in which the teacher is an active presenter and students are active listeners and thinkers. Teachers use advanced organizers-powerful concepts to which subordinate ideas and facts can be linked-to provide structure and then involve students in processing the new information.

The presentation strategy is grounded in information processing theory, which describes how learning occurs and how the mind organizes knowledge. The brain utilizes short-term memory for complex thought processes and long-term memory for information storage. Stored information is organized according to hierarchically ordered concepts and categories called cognitive structures. New information must be processed actively in short-term memory and tied to students' existing cognitive structures in long-term memory. Just as the mind has cognitive structures, every discipline has an organizational structure. Presentations should be organized around key ideas and structures and these structures should be made explicit to students.

Presentation enables teachers to organize and convey large amounts of information efficiently. It is an appropriate strategy for instructing students about the key ideas in a subject, for acquisition and retention of factual information linked to these ideas,

and for comparing similarities and differences among ideas. Presentation is less appropriate for higher-level thinking, problem solving, and inquiry, although it may be used prior to such activities to ensure that students have the necessary foundational information.

Concept teaching : Concept teaching helps students learn concepts and develop higher level thinking skills. Concepts (such as round and integer in mathematics, scarcity and freedom in social studies, energy and motion in science, and comedy and tragedy in literature) serve as the foundation for knowledge, increase complex conceptual understanding, and facilitate social communication. There are several different approaches to concept teaching. The approach described here is called concept attainment and is an inductive process in which students construct, refine, and apply concepts through teacher-directed activities using examples and non-examples and in which students learn to classify, recognize members of a class, identify critical and noncritical attributes, and define and label particular concepts.

Cognitive theorists such as Jean Piaget and Jerome Bruner and information processing psychologists such as Robert Gagne emphasized that thinking is organized around conceptual structures. Children begin learning concepts very early through interaction with concrete objects. Conceptual structures continue to develop with increasing complexity and abstraction throughout life. Concept formation requires students to build categories (an island is land surrounded by water; a noun is a name for a person, place or thing). Concept attainment requires students to figure out the attributes of a category (e.g., a triangle has three sides and three angles; an adjective describes a noun). Young children can categorize using one rule or attribute (a bird has feathers), but students gradually develop the ability to use multiple rules or attributes (birds have feathers, lay eggs, have feet, and are warm-blooded) and to distinguish noncritical attributes (some birds fly, but not all birds). Examples and non-examples are used to help students construct new concepts (a diary is a primary source, but a novel is not).

The primary purpose of concept teaching is to learn new concepts. It is also effective for teaching higher-level thinking, including inductive reasoning, hypothesis formation, logical reasoning, concept building strategies, and taking multiple perspectives (Is a slave's concept of slavery different from a master's concept?). Although not designed to convey large amounts of information, students must process information as they formulate new concepts.

Concept teaching has four phases. In phase 1 the teacher explains the purposes of the lesson, describes why concepts are important, and gets students ready to learn. The second phase consists of presentation of examples and non-examples of the concept.

The teacher gives examples and non-examples, and the students strive to discover the concept and its attributes through inductive reasoning.

After the concept has been discovered, the teacher gives more examples and non-examples, then asks students to provide examples and non-examples. The purpose of this tactic is to test student understanding of the concept and its attributes. A concept lesson concludes with the teacher asking students to analyze their thinking patterns, strategies, and decisions in order to develop more effective thinking skills and to help students integrate the new concepts into existing knowledge.

The learning environment for concept teaching has a moderate degree of structure in that the teacher controls the first three phases of the lesson rather tightly. The fourth phase is more open and student interaction is encouraged. As students gain more experience with concept learning, they can assume increasing responsibility for how the lesson proceeds.

Discussion is central to all aspects of teaching. Classroom discussion may serve as a strategy in itself or as part of another strategy. Teachers and students talking about academic content and students displaying their ideas and thinking processes to the teacher and to each other characterize discussions. Effective discussions go beyond question-and-answer recitations. The more involved students are in the discussion, the more effective the learning. Discussion is an appropriate strategy for improving student thinking; promoting engagement in academic content; and learning communication and thinking skills in a social environment. Discussion is particularly appropriate for topics that are subjective or controversial and that involve several points of view, such as the causes of World War I or funding of stem-cell research.

Classroom discussion proceeds through five phases. The teacher introduces the discussion by providing a clear purpose for the discussion and engaging students so they will become involved. This is followed by phase 2 where the teacher sets the ground rules, then poses a question, raises an issue, or presents a puzzling situation.

Cooperative learning : In cooperative learning students work together in small groups on a common learning task, coordinate their efforts to complete the task, and depend on each other for the outcome. Cooperative learning groups are characterized by student teams (of 2-6) working to master academic goals. Teams are normally composed of learners of mixed ability, ethnicity, and gender. Rewards systems (grades) are designed for the group as well as individuals.

Cooperative learning is rooted in two theoretical traditions. First, it is based on the progressivism of John Dewey, particularly his idea that the school should mirror the values of the society and that classrooms should be laboratories for learning democratic values and behaviors. Students are prepared for civic and social responsibilities by

participating in democratic classrooms and small problem-solving groups. Cooperative learning also has roots in constructivist theory and the perspective that cognitive change takes place as students actively work on problems and discover their own solutions. Particularly important is Lev Vygotsky's theories that students learn through language-based interactions with more capable peers and adults.

Cooperative learning has three distinct goals: academic achievement, acceptance of diversity through interdependent work, and development of cooperative social skills.

There are numerous approaches to cooperative learning and each proceeds in slightly different ways. However, in general, a cooperative learning lesson has six phases. The teacher begins the lesson by presenting the goals of the lesson, motivating students, and connecting the forthcoming lesson to previous learning. Procedures, timelines, roles and rewards are described. Required group processes or social skills may also be taught at the beginning of a cooperative learning lesson.

In phase 2 the teacher facilitates the acquisition of the academic content that is the focus of the lesson. This may be done verbally, graphically, or with text. The teacher during phase 3 explains how the teams are formed and helps students make transitions into their groups. Phase 4 is teamwork. Students work together on cooperative tasks and the teacher assists students and groups, while reminding them of their interdependence.

The final phases of a cooperative learning lesson consist of phase 5 (assessment) and phase 6 (recognition). The teacher tests student knowledge or groups present their work. Individual students and groups are assessed on cooperation as well as academic achievement. The effort of individuals and groups are recognized through displays, newsletters, presentations, or other public forums.

The learning environment for cooperative learning differs markedly from the traditional individualistic classroom environment. Students assume active roles and take responsibility for their own learning. The social atmosphere is collaborative and respectful of differences. Students learn group processes and problem-solving skills and become increasingly independent in using them. Students construct their own learning through active engagement with materials, problems, and other students. The teacher forms the teams, structures the group work, provides materials, and determines the reward structure, but the students direct their own work and learning.

Instructional Materials :

They allow teachers to make the learning experience more fun and practical and can also encourage students to take more of an active role in their education. The

objective of using instructional strategies beyond subject comprehension is to create students who are independent strategic learners.

Instructional material takes the pupil to formulate or generate ideas in order that learning would be faster and easier. These certain characteristics; first on the online, it should be on the level of the learner. Second, it should be related and relevant to the subject matter. It should be clearly understood. Some characteristics of a good IM's that will help you in your teaching process; The size, it is the must that the material is big enough to be seen by the farthest students in the classroom.; The color, the students are more interested to those materials w/c are colorful and beautiful.; The durability, Instructional materials are not made for one session only they must last if possible until lifetime so that it can be reuse; The economy, consider also the salary of the teacher his expenses in making that instructional material. Its portability, your material must be easy to handle and carry so that it is more convenient for your part wherever you will teach.

The instructional material should arouse the interest of the pupil. The materials used give opportunities for enrichment and remediation to ensure effectiveness in the creation of IM's, a teacher must be resourceful and creative. The importance of characteristics of IM's it helps the teacher to facilitate the teaching-learning process. These visual aids are important in motivating and arousing your student's interest. More important instructional software, if used effectively, instructional software is beneficial to students because it cultivates engagement, motivation, interest in learning and personalized learning.

Characteristics of Good Teaching Learning Resources / TLM / Teaching Aids

A few characteristics of good teaching aids are as follows :

1) Teaching aids are large enough to be seen by the students for whom they are used.
2) Teaching aids are meaningful and they always stand to serve a useful purpose.
3) Teaching aids are up to the mark and up to date in every respect.
4) Teaching aids are simple, cheap and may be improvised.
5) Teaching aids are accurate and realistic.
6) Teaching aids are according to the mental level of the learners.
7) Their purpose may be informative but it is not just entertainment.
8) Teaching aids help in realization of stipulated learning objects.
9) Teaching aids are really very useful and can be used in many lessons and at different class levels.

10) Teaching aids are useful for supplementing the teaching process but they cannot replace the teacher.

Advantages of Instructional Resources / Teaching Aids

1) Supplement in verbal instructions.
2) Teaching aids makes learning permanent.
3) Teaching aids provide variety.
4) Teaching aids are helpful in attracting attention of the students.
5) Teaching aids saves time and energy.
6) Teaching aids encourages the healthy classroom interaction.
7) Teaching aids helps the teacher to create situations for teaching the beginners.
8) Teaching aids are helpful in creating positive environment for discipline.
9) Teaching aids are helpful in meeting individual differences.
10) Teaching aids helps in providing speech training to the pupils.
11) Teaching aids enable the children to retain language items for a longer time.
12) Teaching aids gives vividness to the learning situation.
13) Teaching aids makes the abstract ideas concrete and thus help in making learning more effective.
14) Teaching aids provide good substitutes for the real objects as they make learning equally meaningful.
15) Teaching aids help in the development of various skills such as, how to draw a diagram of the topic among the students.

How to Use Instructional Resources / Teaching Learning Materials / Teaching Aids

1) Teaching aids should be simple and brief.
2) Teaching aids should be related to the objectives of teaching.
3) Teaching aids should be big door to be seen by all the students.
4) Teacher must use proper teaching aids according to the interest of the student.
5) Teaching aids should be prepared and planned in advance.
6) Teaching aids should be properly selected according to the physical and mental level of the student.
7) Teaching aids should be colorful and should have direct impact on the lesson.

8) Teaching aids should be meaningful and interesting.

Where to Use Instructional Resources / Teaching Learning Materials/ Teaching Aids ?

1) When the subject is for remove in time.
2) Where the subject is too far, distance to be actually seen.
3) Where the subject is too small to be seen by the whole class.
4) Where the subject is too big to be bought in the class.
5) Where the growth of the process is slow.

Criteria for evaluating instructional materials :

Criteria for evaluating instructional materials is very important to make teaching effective and meaningful, here are some criteria: Content Aligns with curriculum and standards, and is current, valid and reliable, with real world examples. Design to meet the interest of the individual learners from various skills levels. Enhances conceptual understanding and engages higher order thinking skills. Free from bias. Equity and Accessibility Materials are durable, easily stored, transported and are universally accessible. Materials are easily updated and are adaptable and customizable to match the resources of the school.

Appropriateness : Materials are appropriate for the subject matter, and also appropriate for the learner's capacity or levels of learning.

Presentation : Comprehensiveness of student and teacher resources; alignment of instructional components; organization of instructional materials; readability of instructional materials; pacing of content; ease of use and durability of materials.

Learning : Motivational strategies; teaching a few "Big Ideas;" explicit instruction; guidance and support; active participation of students; targeted instructional strategies; targeted assessment strategies.

Cost : The materials used for teaching should not be expensive, as long as it eye captivating and catches the attention of the students then it is an effective instructional materials.

5.6 Summary

Pedagogy encompasses how teachers think and how teachers act, that is teacher thinking and teacher doing, the one impacting on the other, and with the third dimension of the visible, observable and measurable impact of the teachers' pedagogy on the learners. Pedagogy naturally embeds all of the key values and philosophy in a

developmentally and culturally appropriate way. The following figure illustrates the Developmental Pedagogical Continuum.

A concept is the sum total of what we know about the object. It refers to a generalized idea about the objects, persons, events. Concept can be formed by direct experience or by indirect experience. Concept formation involves perception and abstraction. Students are challenged and supported to develop deep levels of thinking and application. Students are challenged to explore, question and engage with significant ideas and practices, so that they move beyond superficial understandings to develop higher order, flexible thinking that is conceptual learning. Teaching sequences promote sustained learning that builds over time and emphasizes connections between ideas. Teachers have a very crucial role in promoting engagement that leads to concept formation.

In concept learning, Problem-based learning (PBL) is a very useful method that takes a student-centered approach, usually conducted within small groups. The teacher acts as a facilitator in problem-based learning. Problem-based learning and inquiry-based learning are not mutually exclusive; rather, problem-based learning involves inquiry strategies. Some objectives of PBL are: (1) helping students develop cognitive flexibility; (2) practicing problem-solving skills as generic skills; (3) self-directed learning which requires high metacognitive ability; (4) practicing collaborative skills and communication skills; (5) increasing intrinsic motivation.

Critical thinking is a complex mental process involving paying attention to details, selecting relevant information, analyzing carefully and skeptically, making judgments, and metacognitive thinking such as reflection and higher-order planning. Critical thinking and creative thinking both as a generic thinking skill, is emphasized in a variety of content areas of curriculum planning documents across cultures. There are different pedagogical models in use for inculcation of such skills.

Classroom communication is a vital ingredient in the instructional and learning process in the school environment. The quality and quantity of teacher-student interaction is a critical dimension of effective classroom teaching. The term 'interaction' implies an action - reaction or a mutual or reciprocal influence which may be between individuals. Interaction Analysis (IA) is an analytical observation scheme that gives an insight into what a teacher does while teaching. It is a systematic observation that represents a useful means of identifying, studying, classifying and measuring specific variables as the teacher and his/her students interact within instructional learning situations. Flanders' interaction analysis system is an observational tool used to classify the verbal behaviour of teachers and pupils as they interact in the classroom. Flanders' instrument was designed for observing only the verbal communication in the classroom and non-verbal gestures are not taken into account.

Since the inception of formal, classroom-based instruction, a fundamental aspect of teaching has been the way teachers arrange the classroom environment so students can interact and learn. The instructional strategies teachers use help shape learning environments and represent professional conceptions of learning and of the learner. "The purposeful direction of the learning process" and is one of the major teacher class activities is instruction. Instructions may be of different kinds. Direct instruction is a method for imparting basic knowledge or developing skills in a goal-directed, teacher-controlled environment while indirect instruction for teaching concepts is based on inquiry, and problem solving that is learner-centered in nature. Teachers need to develop mastery of usinginstruments on the basis of the nature of learners and subject. Preparing best instructional materials and their purposive use is also the responsibility of the teachers.

5.7 Self-Assessment Questions

1. What is meant by the Developmental Pedagogical Continuum? Illustrate through a model
2. What is problem-based learning? Explain the principles of problem-based learning.
3. Developmentally appropriate pedagogy and instruction after Vygotsky.
4. Explain how Critical Thinking and Knowledge construction are related.
5. Explain how to develop the development of social cognitive skills and affective skills.
6. Mention the basic theoretical assumptions of Flanders Interaction Analysis
7. What are the advisable Precautions in the Use of Flanders Interaction Analysis? What is the limitation of such a classroom observation method?
8. Explain the relation of teaching and Instruction
9. What is meant by instruction? Differentiate between direct and indirect instruction with exemplification.
10. What is meant by Instructional Materials? Mention the characteristics of good instructional materials and explain how to use instructional material.

5.8 References

Amatari, V. O. (2015). The instructional process: a review of Flanders' interaction analysis in a classroom setting. Int J Second Educ, 3(3), 43-49.

Barrows, H. S. (1996). Problem?based learning in medicine and beyond: A brief overview. New directions for teaching and learning, 1996(68), 3-12.

Boekaerts, M. (1999). Self-regulated learning: Where we are today. International journal of educational research, 31(6), 445-457.

Collins, A., &Kapur, M. (2006). Cognitive apprenticeship. na. in The Cambridge Handbook of the Learning Sciences, pp. 109 - 127. Cambridge University Press. https://doi.org/10.1017/CBO9781139519526.008

Collins, A., Brown, J. S., &Holum, A. (1991). Cognitive apprenticeship: Making thinking visible. American educator, 15(3), 6-11.

Cottrell, C. A., &Neuberg, S. L. (2005). Different emotional reactions to different groups: a sociofunctional threat-based approach to" prejudice". Journal of personality and social psychology, 88(5), 770.

Cowie de Arroyo, C. (2011). From PYP to MYP: Supporting transitions across the IB continuum. Voces y silencios. RevistaLatinoamericana de Educación, 2(1), 39-61.

Dochy, F., Segers, M., Van den Bossche, P., &Gijbels, D. (2003). Effects of problem-based learning: A meta-analysis. Learning and instruction, 13(5), 533-568.

Farquhar, S. E. (2003). Quality Teaching Early Foundations: Best Evidence Synthesis. New Zealand Ministry of Education.

Hmelo-Silver, C. E. (2004). Problem-based learning: What and how do students learn?. Educational psychology review, 16(3), 235-266.

Husbands, C., & Pearce, J. (2012). What makes great pedagogy? Nine claims from research. National College for School Leadership.

Joyce, B., Weil, M., & Calhoun, E. (2003). Models of teaching.

Karasavvidis, I., Pieters, J. M., &Plomp, T. (2000). Investigating how secondary school students learn to solve correlation problems: quantitative and qualitative discourse approaches to the development of self-regulation. Learning and Instruction, 10(3), 267-292.

Kolodner, J. L., Camp, P. J., Crismond, D., Fasse, B., Gray, J., Holbrook, J., ... & Ryan, M. (2003). Problem-based learning meets case-based reasoning in the middle-school science classroom: Putting learning by design (tm) into practice. The journal of the learning sciences, 12(4), 495-547.

Kolodner, J. L., Camp, P. J., Crismond, D., Fasse, B., Gray, J., Holbrook, J., ... & Ryan, M. (2003). Problem-based learning meets case-based reasoning in the middle-school science classroom: Putting learning by design (tm) into practice. The journal of the learning sciences, 12(4), 495-547.

Li, K. 2010. "A comparative study of the curriculum guidelines of high school in Taiwan and Japan". 教育资料集 刊, 46. Pp 55-77.

Mac Naughton, G., & Williams, G. (2008). Teaching Young Children: Choices in Theory And Practice. McGraw-Hill Education (UK).

OECD. (2006). Starting Strong II: Early Childhood Education and Care. Paris: OECD.

Renninger, K. A. (2009). Interest and identity development in instruction: An inductive model. Educational psychologist, 44(2), 105-118.

Rogoff, B., Baker?Sennett, J., Lacasa, P., & Goldsmith, D. (1995). Development through participation in sociocultural activity. New Directions for Child and Adolescent Development, 1995(67), 45-65.

Rosenshine, B. (1987). Explicit teaching and teacher training. Journal of teacher education, 38(3), 34-36.

Shulman, L. (1987). Knowledge and teaching: Foundations of the new reform. Harvard educational review, 57(1), 1-23.

Sternberg, R. J. (1990). Metaphors of mind: Conceptions of the nature of intelligence. Cambridge University Press.

Sultan, W. H., Woods, P. C., & Koo, A. C. (2011). A constructivist approach for digital learning: Malaysian schools case study. Journal of Educational Technology & Society, 14(4), 149-163.

Tang, F. L., & Shen, J. L. (2005). Thoughts About Problem-based Learning And The Educational Reality of China [J]. Comparative Education Review, 1.

Vandermensbrugghe, J. (2004). The unbearable vagueness of critical thinking in the context of the Anglo-Saxonisation of education. International education journal, 5(3), 417-422.

Walker, K., & Bass, S. (2012). Engagement Matters Personalised Learning for Years 3 to 6. Camberwell, Australia: ACER Press.

Winther-Lindqvist, D. (2012). Developing social identities and motives in school transitions. Motives in children's development, 115-132.

Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. Theory into practice, 41(2), 64-70.

Unit–6 : Teacher and Teaching

Structure

6.1 Objectives

In this Unit, we have tried to introduce you to the more fundamental issues relating to the process of teaching. More clearly speaking the memory, understanding and reflective levels of teaching. Apart from such dimensions of teaching, the basic methods of teaching learning transactions like Lecture, Demonstration, Problem Solving and Programme Instruction are also explained with examples. And finally, the more broader role of teacher as facilitator, counselor and researcher are also discussed. After the end of this unit, you should be able to :

- Understand and apply Memory Understanding and Reflective phase of Teaching

- Explain and demonstrate different teaching methods with example
- Differentiate between the different methods of teaching
- Explain why reflective Phase is crucial in quality development of teaching
- Explain Function of a Teacher as Planner, Facilitator, Counselor
- Explain how Teacher Research matters in innovation and problem-solving in teaching learning challenges.

6.2 Introduction

Pedagogy, curriculum and culture provides an overview of the key issues and dominant theories of teaching and learning as they impact upon the practice of classroom teachers; punctuated by questions, points for consideration and ideas for further reading and research. Every teacher operates according to a theory or theories of learning and within the context of a philosophy of what education should be fundamentally about. The only difference is that sometimes these theories are very consciously held and operated upon by the teacher, perhaps carefully referenced to published theory in the field, while others are held and operated upon rather less consciously, with perhaps little or no reference to published theory. Despite content process debate or behaviorist or cognitivist or constructivist, as teaching is performing hence it has specific sequence which essentially follow memory level, understanding level and finally reflective level. It is really not possible to single out any pedagogical approach but teaching is a combination of lecture demonstration, authentic engagement for problem solving and the learner may be exposed to programme instruction based on certain pedagogical principles. Role of teacher cannot be confined only with the formal task of learning teaching. Rather, teachers need to play the role of planner, facilitator, counselor and action researcher that could contribute in qualitative upscaling of teaching and all-around development of learners. This unit has dealt with these issues.

6.3 Levels of Teaching: Memory, Understanding and Reflective

Levels of Teaching

We all know that teaching is a purposeful activity. Through teaching the teacher brings a desirable change in the learner. Both the concepts teaching and learning are interrelated to each other. Development of the all-round personality of the learner is the final goal of teaching and learning. During teaching an interaction takes place between an experienced person (teacher) and an inexperienced person (student). Here the main aim is to bring change in the behavior of the student.

Teachers teach students at three levels. They have to keep in mind the developmental stage of the learners so that desired educational objectives can be achieved. These three levels are

1. Memory level : Thoughtless teaching
2. Understanding level : Thoughtful teaching
3. Reflective level : Upper thoughtful level

Here you will get the idea of all these three levels of teachings along with their advantages and disadvantages.

6.3.1. Memory Level of Teaching

It is the first and thoughtless level of teaching. It is concerned with memory or mental ability that exists in all living beings. Teaching at memory level is considered to be the lowest level of teaching. At this level,

- The thinking ability does not play any role.
- Students only cram the facts, information, formulas and laws that are taught to them.
- The teaching is nothing but learning the subject matter by rote.(Bigge, Morris L(1967)
- The role of the teacher is prominent and that of the student is secondary.
- The study material is organized and pre-planned. The teacher presents the study material in a sequential order.

Memory level teaching lacks insight. Psychologically, it is cognitive level teaching

Herbart's Model of Memory Level Teaching

Herbart was the exponent of memory - level teaching. Herbart described the following steps for presenting the model of memory level of teaching.

1. Focus
2. Syntax
3. Social System.
4. Support System.

Focus– Emphasis on crammingof facts & development of the following capacities.

1. Training of mental aspects.
2. Providing knowledge of facts.
3. Retaining the learnt facts.
4. Recalling & Re-presenting the learnt facts.

Syntax Herbert's five steps-

1. A) Preparation– The pupils are prepared to acquire new knowledge by testing their previous knowledge
   B) Statement of aim– Topic clear to the pupils & teacher writes the topic on the black - board.
2. Presentation– Stimulating the students' mental activity, the pupils are provided with opportunities for self - learning.
3. Comparison of association– Herbert named this step as association. Teacher establish a relationship between two subjects, facts & events of the same subject. By comparison, the new knowledge may be clarified & made permanents in the minds of the pupil.
4. Generalization– Herbert named this step as a system. After explaining the basic lesson, the pupils are given the opportunities to think in this lesson. Pupils formulate some principles & laws which can be used in the future life situations
5. Application– Last steps of teaching. Observed, whether there new learnt knowledge can be used in new situations or not. Verified through questioning or new opportunities to make use of learnt knowledge. Makes the knowledge permanent & laws can be verified.

Social system– The process of teaching is social & professional.Pupils & teachers are members of this socialsystem.Teacher occupies the primary place & pupils have a secondary place.

Function of the Teacher–

1. Presenting the contents.
2. Controlling the pupils' activities.
3. Providing motivation.

Support System– ● Cramming is stressful. ● Both oral & written examinations are used. ● Essay type examinations are more useful. ● Recall & recognition are used successfully. ● Through the objective type examination.

6.3.2. Understanding Level of Teaching

Understanding something is to perceive the meaning, grasp the idea and comprehend the meaning. In the field of Education and Psychology, the meaning of 'understanding 'can be classified as

- seeing the total use of facts
- seeing relationship
- a generalized insight

The teaching at the understanding level is of a higher quality than the one at the memory level. It is more useful and thoughtful from the point of view of mental capabilities. At this level of teaching, the teacher explains the student about the relationship between principles and facts and teaches them how these principles can be applied. Memory level teaching barrier is essential to be crossed for this level of teaching.

As compared to memory level teaching, the understanding level teaching has greater merit. This enables students to have complete command over subject material. In the understanding level, the role of the teacher is more active. The students at this level are secondary. At this level, no cramming is encouraged. The new knowledge acquired at this level is related to the earlier knowledge gained. A generalization is made on the basis of facts and the facts are used in the new situations.

Morrison's model of Understanding Level of Teaching

The model of understanding - level teaching was indoctrinated by Morrison, it is named as "Morrison's teaching Model"

Focus– The pupil should achieve the mastery of the concept. Teacher stresses upon the mastery of the content so that a desirable change may occur in the personality of the pupils.

Syntax– Syntax divided into five steps.

1. **Exploration–** ● Previous knowledge testing by questioning. ● Analyzing the contents, the elements are arranged in a logical sequence from a psychological point of view. ● Determining how the units of contents or new. ● Knowledge should be presented.

2. Presentation-Teacher remains more active. He forms the following activities for the presentation of the contents.

- Presents the content in small units to maintain the sequence of these units & a relationship with the pupils' establishments.
- Teacher diagnoses whether the contents have been understood by the pupils or not.
- Teacher recapitulates the contents till most of the pupils acquire the understanding.

3. **Assimilation–** Teacher provides pupils opportunities for assimilation. Assimilation has the following characteristics.

a) Pupils are provided with occasions for generation through assimilation.

b) Assimilation - opportunities are provided in order to stress upon the depth of the content.

c) At the time of assimilation, every pupil studies in accordance with his requirement.

d) In assimilation, the pupils work themselves in laboratories & libraries.

e) Supervised study occurs.

f) Both pupils & teachers remain active.

g) The pupils perform individual activities & teachers guide them according to the need during supervision.

h) During the assimilation period, the teacher tests whether the pupils have achieved mastery over the content or not.

4. **Organization–** Pupils are provided with the occasions forrepresentation, all the pupils write contents in their ownlanguage.The teacher comes to the conclusion whether thepupils can write the contents without anybody's help ornot.The representation in subjects likemathematics, grammar & arithmetic etc, has noimportance.

5. **Recitation–** Last step of understanding level teaching.The pupils present the contents orally before theteacher & his mates.

Social system–

- Teacher controls the behavior of the pupils by providing motivation.
- Teacher imparts instruction to the pupils and they work themselves with full involvement.
- Both extensive & intrinsic motivation is used.

Support System– Support system does not remain static, but it goes onchanging.In assimilation, the pupils have to pass the examination.Assimilation test pass - essentially for their entry intoorganization & recitation.End of the organization period, a written test takes place.Recitation is followed by an oral test.Both oral & written tests (Essay type & objective type)occur during the various steps of understanding level ofteaching.

6.3.3. Reflective Level of Teaching

This level is also known as introspective level. Reflecting on something means giving careful thought to something over a period of time. It also means thinking deeply about something.

Reflective level of teaching is considered to be the highest level at which teaching is carried out.

- It is highly thoughtful and useful.
- A student can attain this level only after going through memory level and understanding level.

- Teaching at the reflective level enables the students to solve the real problems of life.
- At this level, the student is made to face a real problematic situation. The student by understanding the situation and using his critical abilities succeeds in solving the problem.
- At this level emphasis is laid on identifying the problem, defining it and finding a solution to it. The student's original thinking and creative-abilities develop at this level.
- The role of the teacher in this level of teaching is democratic. He does not force knowledge on the students but develops in their talents and capabilities.
- The role of the students is quite active.
- Reflective level of teaching is that which is problem-centered and the student is busy in original imagination.

Hunt's Model of reflective Teaching–

For developing a reflective level of teaching the credit goes to hunt. This teaching model is named as Hunt's model of teaching.

Focus–

1. To develop problems - solving competency among the pupils.

2. To develop critical & constructive thinking among pupils.

3. To develop independent & original thinking power among the pupils.

Syntax–

The individual & social nature, syntax of reflective level teaching is designed in the following four steps.

i) The teacher creates a problematic situation before the pupils.

ii) Pupils formulate hypotheses for testing.

iii) Pupils collect data to verify the hypothesis.

iv) Hypotheses are tested. Results are derived on the basis of these tests which are original ideas of the pupils.

Social System–

The class - room environment is open & independent. Pupil occupies primary & the teacher secondary place. Objectives are as-

a. To present some problem before the pupils.

b. To use discussion & seminar during teaching.

c. To raise the level of aspiration of the pupils.– ● All pupils become active & sensitive for solving the problem. ● Both self - motivation & social motivation have importance.

Support System– Objective type tests are not used, essay type tests usedfor evaluation. Things are evaluated–

i) The attitudes & beliefs of the pupils should be evaluated.

ii) Involvement in the learning activities should be evaluated.

iii) Evaluated the development of the critical & creative competencies of the pupils.

6.4 Teaching Methods: Lecture, Demonstration, Problem Solving and Programme Instruction

6.4.1. Lecture Method of Teaching

One of the most common alternatives used by those at the college level is communicating directly to the students where the talking by the teacher is the most predominant activity, and it is called 'lecture'. 'Lecture' can be talking to the students or talking with the students. When it is talking to the students, it takes the form of one-way communication in which the teacher plays an active role and remains the main focus. It may take the form of two-way communication when the teacher talks with the students. In this way, the lecture becomes a question-answer or discussion activity instead of merely giving information.

Lecture, as a method of instruction, can be traced back to the time of the Vedas and the Upanishads in our country, or to the Socratic dialogue in the Greek context. In Vedic period, a lecture was given through a question-answer method [with the Shishya (student) sitting by the side of the Guru (teacher)]. In the medieval period, however, the preacher (as in a church or a temple) used lecture as a one-way communication, since, in most of these situations, the group of listeners was large. But with the advent of the printing technology, and of late, of the information and communication technology, the role played by a lecture is being redefined. Unlike the past, when it was equated with mere oratory, it is now seen in a different context. Lecture, once considered to be the sole source of information, is now being treated as only one of the different sources of information available to the learners. Apart from its major function of information-giving, it plays certain unique roles which cannot be performed by other inanimate sources. Firstly, the teacher may use it to motivate the students. It is through listening to lectures, that students are attracted to different areas of study. Secondly, the teacher may use it to integrate various sources of

information, and use it as a thread which brings different sources of information into one garland.

Unlike the common belief, the lecture, as a method of instruction, can be used in a structured way. Thus, the lecture follows some specific steps through which it is carried out. Let us discuss these in the following sub-section :

Steps in a lecture

Lecture, as a method of instruction, mainly follows two steps, i.e., Planningand Delivery. The delivery of a lecture is again divided into three phases. These are the introduction, the development and the consolidation phases.

Planning of a lecture

We should dispense with the idea that a lecture does not require planning. An unplanned lecture hardly achieves the objectives of classroom instruction. When we talk of the planning of a lecture, it entails a number of things. The teacher must prepare a lesson plan for the lecture to be delivered. This contains the instructional objectives to be achieved, the amount and nature of content to be covered, the kinds of audio-visual aids that are to be used, class size and nature of students for whom lecture is to be prepared, kinds of questions to be asked, the kinds of other interactional modes to be used, the feedback mechanism to be used, etc. In disciplines which require laboratory work, the teacher must ensure the required logistics inside the classroom such as blackboard, charts, OHP, laboratory equipment to be used, and the seat arrangement of the class. Thus, planning a lecture boosts the confidence of the teacher in handling the class. He/she knows in advance, what to do, when and what not to do. Sometimes, the teacher can plan for humorous interludes, jokes, etc. to make the lecture more interesting. You will know more about this in Block 2, Unit 7.

Delivery of a lecture

As it has already been mentioned, delivery of a lecture is done generally in three phases. Let us now discuss these.

Introduction of a lecture

Sometimes, the introductory phase is also called the warm-up phase. The main task of the teacher here is to establish rapport with the students, create interest and motivation amongst them and gradually lead the learners to the next phase. At this stage the teacher relates the new topic to the one already taught and to the previous experiences. The main function here is to arouse interest and motivate the students. The teacher

also uses the blackboard or any other visual medium to highlight the theme. Some of the examples of planning an introduction of a lecture are given hereunder.

A. Plan an introduction to catch the listener's interest

Suggestion: Raise a question to be answered by the end of the lecture. Example: "By the end of the lecture, you should be able to answer the question.' Are essay test questions better than objective test questions?"' Suggestion: Explain the relationship of lecture content to laboratory exercises, homework problems, professional career interests, etc. Example: "Today, I'll lecture on cost-of-living indices, a topic in macroeconomics which will help you understand the recent discussions related to inflation." Suggestion: Relate lecture content to previous class material. Example: "For the past few weeks, Skinner, Osgood, and others who take a behavioristic view of language acquisition have occupied our attention. Today, I'll introduce another different perspective on language acquisition and learning. We'll spend the rest of this week and the next on understanding this view and comparing it with the behavioristic position."

Alternative; Ask a student to summarize previous course content.

B. Provide a brief general overview of the lecture's content. Example: "In Victorian England the conflict between religion and science was well reflected in the literature of the time. Today, we'll look at two poems. 'In Memoriam' and 'Dover Beach', which illustrate this conflict."

C. Tell students how you-expect them to use the lecture material. Example: "Today I'll offer a specific model of evaluation and illustrate its applicability in several kinds of settings. When you meet in your discussion groupS this week, you'll be asked to apply the model."

D. Define or explain unfamiliar terminology. Example: "In Physics, the term 'work' has a precise technical meaning. The work done by a force, F when the object on which it acts moves a distance q (drawing on the board) is defined by Work = Force x Displacement or W = F.q. It is assumed that F does not change much during the motion through the distance q.

Development phase

This is the most important phase of a lecture, because the transaction of ideas and information between the teacher and the learner takes place here. The teacher explains the concepts and principles, provides facts, data, figures, etc., to the learners. In order to explain the content matter, the teacher cites various examples, uses various communication aids, uses analogies and illustrations, etc. The teacher, when-required, adopts different non-verbal communication techniques such as gestures, postures, etc.,

to facilitate the teaching activity. During this phase, the teacher should be cautious of his lecture otherwise it becomes ineffective.

The following questions relating to Lecture-Delivery should be considered throughout the Development phase.

For vocal delivery, do you :

1. Cue important ideas by varying speech rate, volume and pitch?
2. Speak to students and not to the blackboard, walls, notes or floor?
3. Enunciate clearly?
4. Let your sense of humor show?
5. A void repetition of pet words or phrases (e.g., okay, you know, uh)?

Physical delivery :

1. Establish and maintain eye contact with your students.
2. Use gestures and physical movements which complement your verbal statements (e.g., looking at students while asking for student questions)?
3. Practice in advance with audio-visuals?
4. .Avoid using distracting gestures or. Physical movements (e.g., grooming, pacing)?

Consolidation phase

This is the concluding phase of a lecture. Here the teacher recollects whatever he has covered during the course of lecture. He then summarizes the main teaching points of the lecture either verbally, or by writing- them on the blackboard or by using PPT: The teacher also asks a few questions on the content matter covered, in order to evaluate the students' understanding of the lecture. Through these questions, the teacher gets to know the learning difficulties of students and accordingly modifies his teaching. The teacher also gives some take-home assignments to the students which they are expected to complete and bring back for the teacher's remarks. The teacher also informs the students as to what the next lecture will deal with.

Lecture in combination with other methods and media

In the examples given in the previous section, you might have noticed that during the presentation, different methods and media hardware are used. For example, the English teacher uses group tasks as a method. He also uses individual tasks as a method. The Chemistry lecturer uses an overhead projector to present the graphs prepared by the students. This is an example of the use of hardware. Similarly, a variety of methods and media can be used in combination with the lecture method. To understand this better, you might consider your position as systemic from a wider angle, that is to say, the viewpoint merely from a session or period is-insufficient to

appreciate this fully. Let us look at content treatment from a larger angle, i.e., the treatment on one unit from the prescribed syllabus for which the time allotted is about ten sessions.

During the first session you introduce the topic to the students through a lecture, at the end of which, a home assignment is given for the students to collect information regarding the topic from identified sources.

In the next session, a group task is given to the students to process the information collected, which is followed by a discussion. During the third session, along with one of your colleagues, you teach the students through 'Team Teaching'. Here, you present two distinct viewpoints on the topic under study.

During the course of the fourth and the fifth sessions, you engage them in the laboratory/field work, verifying the alternative viewpoints put forward. In the sixth session, you divide the students into small groups and ask them to discuss their points of view based on their recent experiences and arrive at their conclusions. The teacher acts here as a moderator.

During the seventh session, you present a problem for the students to solve, based on their experiences. A sample of solutions are analyzed to 'Study the merits and demerits of the suggested solutions.

The eighth session is used for independent study in the library and the ninth to give a test on the unit. This is immediately followed by a discussion on the expected responses of the test (the feedback).

Disadvantages

However, the lecture also~

- places students in a passive rather than an active role. Passivity can hinder learning and students' attention may be lost.
- encourages one-way communication; therefore, the lecturer must make a conscious effort to become aware of student problems and student understanding of content.
- requires a considerable amount of unguided student time outside the classroom to achieve understanding and long-term retention of content. In contrast, interactive methods (discussion, problem-solving sessions) allow the instructor to influence students when they are actively working with the material.
- requires the instructor to have or to learn effective writing, speaking and modelling skills.
- places the responsibility of organizing and synthesizing content upon the lecturer.

6.4.2. Demonstration Method of Teaching :

Another teacher-controlled instructional technique widely used in higher education institutions is Demonstration. As college teachers, you may well be acquainted with the word 'Demonstration '. In colleges, especially, Science teachers use demonstration very often, though teachers of other disciplines take recourse to demonstration when something related to teaching of skills comes. A Science teacher demonstrates Newtonian laws, a Music teacher demonstrates a. classical Hindustani music, an Art teacher demonstrates how to sketch and so on. What then is the demonstration? Webster Dictionary defines it as "a public showing emphasizing the salient merits, utility, efficiency, etc., of an article or product". While used in teaching, demonstration means showing how something is to be done or not to be done. It involves the art of depicting the skills associated with an action. Sometimes, ideas, attitudes, processes and other intangibles. are also demonstrated consciously. Let us now discuss in detail the various aspects of demonstration.

Major characteristics of demonstration

i) Both concrete and abstract matter can be effectively demonstrated. Generally, we demonstrate concrete matter or processes connected with them. But abstract matters like discussing the theme of a play or novel, the organization of state or federal governments, can also be demonstrated.

ii) Demonstration is-thought to be the best method for displaying skills in operation. Driving an automobile, playing the sitar/guitar, dissection of a frog, etc., can easily be demonstrated.

iii) Apart from the demonstrator and the audience, demonstration is facilitated by audio-visual materials like the chalkboard, a filmstrip, a film, a recording, a diagram, a chart, etc. Now-a-days, even critical surgery like heart surgery is demonstrated on television.

Principles of demonstration in teaching

The principles of demonstration are the following :

i) **Establishing rapport :** The demonstrator should always maintain a friendly relationship with students. He should be simple and a warm human being as far as possible. He should stimulate interest and arouse curiosity amongst the students.

ii) **Avoiding the 'COIK Fallacy :** The demonstrator must be able to put himself in the role of the observer. Hence, he requires thoughtfulness and. vigilant effort. If he does not make this effort, the demonstrator is likely to commit the CalK Fallacy which stands for "Clear Only If Known'. In this case, the demonstrator knows his subject well whereas the students who are observers may be ignorant of that.

iii) **Watching for key points :** The demonstrator must ensure that the key points in the demonstration are being communicated to the students. Hence, he should lay special emphasis on them, repeat them and highlight them.

Ina demonstration, there are mainly three important steps/considerations. These are preparation, performance and evaluation. Let us discuss these steps. Preparing a classroom demonstration. While making preparation for a classroom demonstration, the demonstrator has to take note of the following points: ,

i) To plan a demonstration that will create interest among the students: The demonstrator should prepare himself in such a way that his performance will create interest among the students as well as make them active and responsive.

ii) 'Plan every step (including materials) carefully: The demonstrator should ensure that the requirements of every step in the task of demonstration are ready and kept in order. He has to make every piece of equipment ready beforehand. It is undesirable to interrupt and go for some equipment once the demonstration is already on.

iii) Rehearse your demonstration: After the procedure has been organised, the demonstrator should rehearse the demonstration in order to test it for clarity, interest, duration and other elements, with a good critic.

iv) Outline the steps-on the chalkboard: In order to make the demonstration understandable, the demonstrator should outline the steps on the chalkboard before the class begins. The teacher may remove the steps one by one when a particular step is completed.

v) Make sure that everyone can see and hear: The teacher should take note of the fact that everyone present during the demonstration can see and hear the teacher. Hence, he should ensure that proper light and seat arrangement exist in the classroom. He must be audible to all the students present.

vi) Prepare written materials: It is known that learning through hearing and seeing is reinforced by written materials. The demonstrator, therefore, should prepare hand-outs which may be provided to the students at the end of the demonstration. He has to keep in mind that written materials should not be handed out at the beginning or in the middle of the demonstration because these may disturb the students.

Performing the classroom demonstration

When the preparation for the demonstration is over, the demonstrator starts the demonstration. The key points here are:

i) **Setting the tone for good communication :** The demonstrator should arouse curiosity, and generate interest among the students and hold their attention as he goes through the stages of demonstration. He/ She should not show his wit or profundity

because these-may confuse the students. He/ She may allow the students to ask questions at this stage, about the purpose of the demonstration.

ii) **Keeping the demonstration simple :** The demonstrator should try to keep the demonstration simple, He should take care of the less capable students and stress much on the main points of the demonstration. He should not try to overload the students with many ideas which he knows.

iii) Not digressing from the main idea sometimes it may so happen that the teacher may digress from the main point and launch into a detailed discussion on something else, which is not the main focus of the demonstration and which can hence be postponed till a later stage. If you do not follow this principle, you will probably frustrate many of your students and in the process, waste a lot of time. Hence the demonstrator should not go out of track during the demonstration.

iv) **Checking continually that your demonstration is being understood :** The demonstrator should always watch his audience and detect signs of bewilderment, boredom or disagreement. He should not have the impression that everything is clear just because no student looks puzzled or asks a question. Hence, he should put questions to the students in order to make sure that his ideas are getting across the students.

v) **Not hurrying your demonstration :** Sometimes, the demonstrator proceeds somewhat fast while demonstrating. He should keep in mind that his students are seeing the demonstration for the first time. He may stop the demonstration for a while and ask questions to the students.

vi) **Not dragging out the demonstration :** Everything in demonstration class should be kept in its proper place. Sometimes, the demonstrator forgets this and walks around the table to grasp something that should have been placed within his reach. This shows his unskillful presentation which mars the students' interest. Facilitating observation by students It may be remembered that the demonstration is for the students to observe keenly. Hence, the object or process being demonstrated should be clearly visible to the students. And, the significant parts/aspects in the demonstration should be observed and described by the students, rather than merely the teacher should encourage the students to pay more attention to the demonstration and observe things on their own.

vii) **Summarizing as the demonstration goes on :** A good demonstrator keeps on summarizing as the demonstration progresses. He uses chalkboard, charts, diagrams or some other devices for the summarizing purpose in a lengthy demonstration.

viii) Distributing handouts in the end: At the end of the demonstration, the demonstrator distributes handouts, which serve as the summary of the demonstration.

These materials must include a step-by- step outline of what the students have just witnessed, followed by the general conclusions and the key points. It may include questions for immediate discussion or for use at the next class meeting.

Input Alternatives-Teacher Controlled

Advantages of demonstration

1. Difficult concepts become clear to most of the students.

2. It provides an interesting forum for the teacher and students to interact.

3. Students can see as to how things happen, they manipulate objects, record their observations, cross-check with each other and evaluate themselves.

4. Students can develop the skills required to perform the given task.

5. Social development, sympathy and empathy can be developed among the students.

Disadvantages of demonstration :

1. It is not effective in a big size class.

2. It takes a lot of time for the teacher to plan for it.

3. It requires teachers' competency and skills to handle the equipment and do it step by step.

4. Some of the demonstrations require a proper natural environment etc. that it is impossible for the teachers to have the demonstration.

5. Same thing does not happen twice.

Teaching Method: Problem Solving

6.4.3. Problem Solving Method of Teaching :

In problem-based teaching methods students are presented with authentic, meaningful problems as a basis for inquiry and investigation. Sometimes called project-based instruction, inquiry learning, or authentic investigation, this strategy is designed to promote problem solving and higher-level thinking skills. All problem-based instruction strategies include more or less the following features: a driving question or problem, interdisciplinary focus, authentic investigation, production of artifacts or exhibits, and collaboration. This strategy is designed to involve students in the kinds of real-world thinking activities they will encounter outside of school from childhood through adulthood. Sample problems include the following :

- Why did the settlers at Jamestown die?
- How can we recycle in the school cafeteria?
- What causes clouds to form different shapes?

- How much peanut butter does our school need for a year and how much would it cost?
- Why did some civilizations thrive while others died out?
- What will happen if the world population doubles in five years?

Like cooperative learning, problem-based instruction has its roots in the progressivism of John Dewey and the constructivism of Jean Piaget, Lev Vygotsky, and Jerome Bruner. Dewey argued that learning should be relevant and engaging through the involvement of students in group projects of their own interest. Piaget theorized that learning occurs through active investigations of the environment in which students construct personally meaningful knowledge. Vygotsky stressed the importance of social, language-based learning. Bruner emphasized the importance of learners working with their own ideas and finding meaning through active involvement and personal discovery.

The primary goal of problem-based instruction is learning content through inquiry that can be applied in authentic situations. Students learn to think and behave like adult workers, scholars, and problem solvers and to regulate their own learning. They learn collaboration skills and research and inquiry strategies, and gain an understanding of knowledge as complex, multifaceted, and uncertain.

Problem-based instruction involves five phases similar to those in cooperative learning. A lesson may extend over several days or even weeks. Phase 1 is orientation to the problem. The teacher presents the problem or driving question, provides the parameters for student inquiry, and motivates students to engage in problem-solving activities. In phase 2 the teacher assists students in forming study groups and assists the groups in defining, planning, and organizing tasks and timelines, and by clarifying roles and responsibilities. During the students' investigation, phase 3, the teacher encourages, questions, and assists students in data/information gathering, hypothesis formulation and testing, and the generation of explanations and solutions. Guiding and coaching is emphasized, not directing and telling. Problem-based lessons are brought to conclusion through student presentation of products and exhibits, phase 4, and through reflection, phase 5. The teacher assists students in planning, preparing, and presenting products that share their work with others. These might include reports, videos, multimedia presentations, murals, plays, reenactments, models, diaries, or computer programs. After presentations, the teacher helps students reconstruct and analyze their thinking processes and integrate their learning.

Problem-based instruction is the most student centered of the strategies presented. Students work actively and independently on problems that interest them. This requires an environment that is open and safe for asking questions, forming hypotheses, and

sharing ideas. The teacher's role is to pose problems, ask questions, facilitate investigation and dialogue, and provide support for learning.

6.4.4. Teaching Method: Programme Instruction

In 1954 James Howard and B F Skinner developed the Auto instruction Method which fashioned the base for Programmed Learning. For the first time in 1963 NCERT started the preparation of Material for programmed Instruction / Learning and sincere attempts were made for the use of programmed instructions in the class room and in providing programmed study material to the students of distance education. He stated that "education is perhaps the most important branch of scientific technology" and "in the present state of our knowledge of educational practices, scheduling [of behaviors and consequences] appears to be most effectively arranged through the design of the material to be learned". Skinner was at the forefront in articulating the need to accomplish this scheduling of behaviors and consequences and a program for effective and efficient learning through operant conditioning.

Operant conditioning is a form of conditioning that reinforces desired behavior and it is this behaviorist theory that forms the basis for programmed instruction. "important features of personal instruction" (Skinner, 1986)

Leith (1966) : Programmed is a sequence of small steps of instructional material (called frames), most of which require a response to be made by completing a blank space in a sentence. To ensure that expected responses are given, a system of queuing is applied and each response is verified by the provision of immediate knowledge of the result. Such a sequence is intended to be worked at the learners own pace as individualized self-instruction.

Jacobs, et al (1974) : Self-instructional programmes are educational materials from which the students learn. These programmes can be used with many types of students and subject matter, either by themselves, hence the name "self-instruction" or in combination with other instructional techniques.

Principles of Programmed Instruction

1. **Principle of Small Steps :** It is a well-known fact that a learner learns better if the content matter is presented to him in suitable small steps. Therefore, in programmed instruction the subject matter is divided into sequenced and meaningful very small steps called frames, which are presented to the learner one at a time for responding.

2. **Principle of Active Responding :** In Programmed Instruction a learner is provided information in frames and he is supposed to be very active in responding to the

individual frames as the learner is provided only one frame at a time and is allowed to proceed further only on completing the previous frame, thereby keeping him active and meaningfully busy throughout the programme.

3. **Principal of Immediate Reinforcement :** The learner understands better when he is motivated to learn by receiving the information of the result just immediately after responding, which is also in accordance with the psychological phenomenon of reinforcement in learning. In programmed instruction it is important to provide immediate results of individual frames so that the learner will get appropriate reinforcement in time.

4. **Principle of Self-pacing :** The concept of programmed Instruction has actually emerged on the concept of providing learners an opportunity to learn at their own pace. The programme should be prepared keeping in view the principle of self-pacing, so that the learner can respond and move from one frame to another according to his own speed of learning.

5. **Principal of Student-testing :** In programmed learning as the learner gets the results of his learning while the process of learning provides him continuous evaluation of his own learning. In this process the learner has to leave the record of his own response because he is required to write a response for each frame on a response sheet. This detailed record helps in revising the programme and acts as a source for studying and improving the complex phenomenon of human learning.

Types of Programmed Instruction

1. Linear or Extrinsic Programming
2. Branching or intrinsic Programming
3. Mathletics programming
4. Ruling System of programming

This type of programming is referred to as 'linear' as the sequence of frames and path of learning in this programmed learning is systematic and linear. Here all the learners have to proceed through the same frames and in the same order. The whole instructional procedure is well controlled. However, this control is quite extrinsic exercised by the programmer and so, linear programming is also referred to as extrinsic programming.

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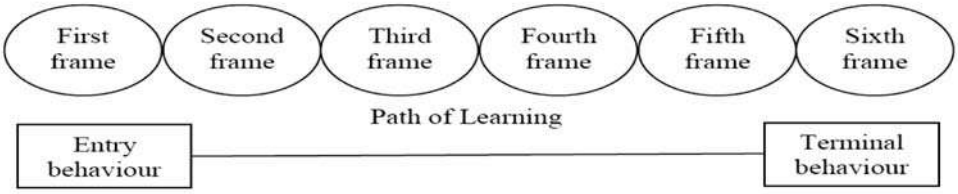


Figure : Arrangement of frames in lines programming

Example : Our Digestive System

Frame 1

The Mouth is an important organ of our Digestive system. The other parts of the system are esophagus, stomach, small intestines, large intestines, rectum and anus. The mouth, and stomach are responsible for digestion of the food, the small intestines help in digestion and absorption of the food and……..are responsible for absorption of water. The rectum helps in temporary storage of ……..

Response : Large Intestines; Wastes.

Frame 2

In addition to the organs of the digestive system there are a large number of enzymes that help in the process of digestion, some of them are secreted by mouth, some by ……. and some others by the intestines. Besides there are some hormones which also aid in the process of……

Responses : Stomach; Digestion

In this manner, the students may proceed on their self-learning path by going from one frame to another arranged in a sequential and systematic way.

Branching or Intrinsic Programming :

Norman A. Crowder (1957), an American psychologist is credited for developing the branching programme of programmed instruction. In his own words, branching or intrinsic programming is one which adapts to the need of the students without a medium of an extrinsic device such as a computer, In contrast to linear programming; this style provides an intrinsic arrangement in the sense that it is not controlled extrinsically by the programmer. Here, a learner is free to make decisions and is able

to adapt the instruction to his needs. The basic assumptions underlying this style are as below :

1. When the learning material is presented in its totality or in the form of meaningful components or units, the learning gets better.
2. Learning takes place better if the students are made to learn on the pattern of traditional tutorial methods.
3. Due to the Student's exposure to the new material, basic learning takes place.
4. In a learning process, errors may occur. If an error occurs, it may be detected and corrected before proceeding further on the learning path. The biggest advantage of branching programming is that the wrong responses do not necessarily hinder the learning of a correct response.
5. Learning takes place better if a learner is allowed sufficient freedom to make decisions for adapting the instruction to his needs.
6. Learning will be better if each response is used to test the success of the latest communication to the student and the testing is followed by remedial instruction.
7. Multiple-choice items help more in the learning process than the force choice single response items.

Based on the above assumptions, the procedure for branching programme may be outlined in the following way :

1. The size of the frames is quite larger in branching programming than that employed in linear programming and instructional material is divided into 'units' of material called 'frames'. Much information, one or two paragraphs or even a page, is provided in a frame.
2. The learner is provided more than one choice while responding to the frames as he is required to respond to multiple choice questions associated with the learning material of the frame. He has to discriminate and choose one right answer.
3. The learner moves forward if he answers correctly, but is diverted (branched) to one or more remedial frames if he does not. These frames explain the matter afresh, ask him questions to elicit the right answer and reveal his previous mistakes, and then return him to the original frame.
4. This cycle goes on till the learner passes through the whole instructional material at his own pace.

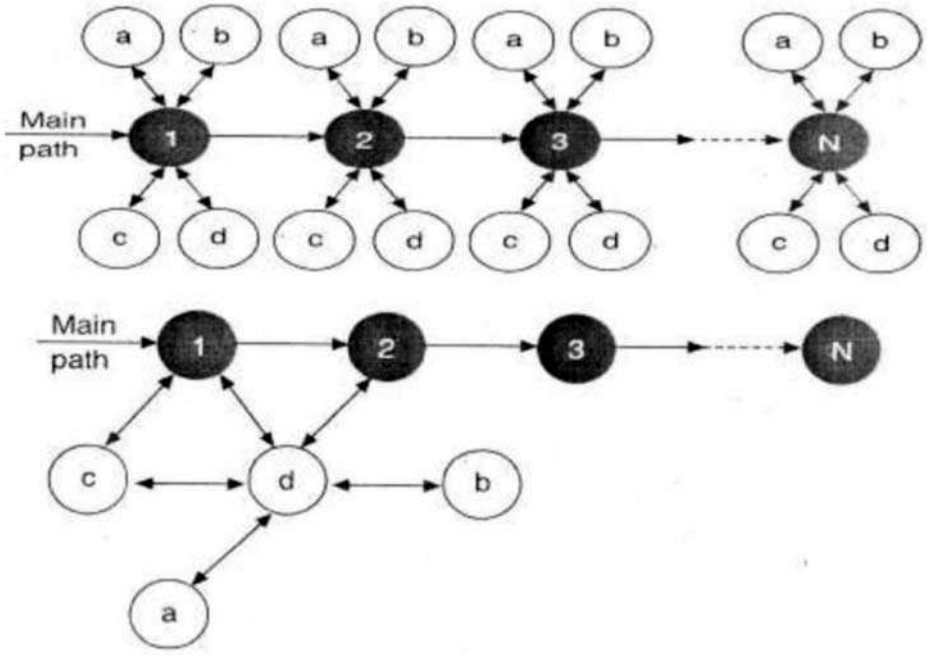


Figure : A diagrammatic representation of the main path and branching in branching programming.

6.5 Functions of a Teacher as Planner, Facilitator, Counselor and Action Researcher

6.5.1. Function of Teacher as Planner

Teachers are planners. This is the essential role of successful teaching. Before all else, the teacher must develop a good 'flight plan', it must lay out a destination and the path to that destination. A well-conceived plan is fundamental to a successful learning experience. Without a good plan, the inexperienced teacher may fail to reach the goal. Then they must pick themselves up and go on to the next flight. The beginning teacher first becomes a manager and then a planner. As any senior teacher will admit, crashes lead to successes; successes, to experience; and experience lead to the happy veteran teacher.

Planning is preparing a course of action to achieve specific objectives. There are three levels of planning. Planning covers following areas:

The Curriculum Planning :

Teacher must be a curriculum planner. The school curriculum is a long-term plan of action. It is the combined total of what a student should learn and when he should learn it. Well-developed curriculum has two dimensions, each composed of two elements. Curricula are horizontal, referring to what aspects need to be addressed within a level (2nd grade), and vertical, meaning what students should be learning from one grade level to the next (reading, science, etc). Both of these dimensions involve scope, what is to be taught, and sequence, the order it is to be taught in.

It is important to note here that effective curricula are "living" instruments, that is, they are in a constant state of flux. Teachers and specialists work together to respond to changes in student learning styles, creative approaches and new materials. These working curricula are functional. Teachers are able to use the curriculum to aid in their planning and use their planning to improve the curriculum. It is a vital tool that is in a state of constant revision. Far too many schools have showcase curricula.

The Unit Planning :

Teachers' involvement most often begins at the unit phase of planning. Units are just that, they are units of the curriculum that teachers can work with. These manageable blocks of a curriculum can be adapted for lessons taught over a segment of time, weeks or months. A unit might be 'Cell Division'. Teachers often assign catchy names to their units: The Magic of Cell division(study of mechanism with stages of cell division). Experienced teachers often use two types of units: the resource unit and the working unit.

Resource units are storage folders or boxes or cabinets that contain resource materials for units. For example, a third grade class might have four science units- plants, animals, sounds, and colors. The teacher would then have four resource units set up to store materials, ideas, pictures, worksheets, etc.

The working unit is vital to the success of a teacher. Updating the elements of a unit are needed to maintain the unit as an effective teaching instrument. The three basic parts of a good teaching unit are the objectives, the methods (activities) and the assessments. Other things can be included, such as, a list of needed materials, technology needs (web sites and videos), worksheets to be used, tests or rubrics, bulletin board ideas, etc. The "other things" are organizational aspects of a unit that help to save the teacher time by all the needs of the unit in one place.

The Lesson Plan

The lesson plan is a plan for the day. It is specific and time sensitive. Listed in the lesson plan is the objective, the activities and the assessment. The activities are

the prime part of the plan. The activities should be laid out in sequence of their occurrence and the approximate time to complete the activity. Timing is a key to success. Inexperienced teachers point to this as a major problem. Lesson plans are too short or too long. It takes a few months for the new teacher to hone their skills at timing.

Daily lesson plans are the "bread and butter" of the teacher. A clearly stated objective will clarify the assessment. Well thought-out activities that develop the objective will lead to the assessment. The well-planned lesson reduces classroom management difficulties. The greatest difficulties arise in classrooms of the teacher who has not planned well. Students need direction. Students who are left to design their own plan will probably do just that.

Teachers do not have to be talking all the time or directing every activity. Students do need to be actively engaged in an activity designed by the teacher. Teachers need to be aware of what is happening in the classroom and why it is happening. This is referred to as control. Teachers who control their class are directing activities and children are not creating their own adventures unless this is the teachers' activity. Loss of control (a classroom management issue) is often the result of poor planning and is probably the single most frustrating aspect of the teacher's job.In conclusion, a teacher who plans well will succeed.

Preparation and planning are a critical component of effective teaching. Lack thereof will lead to failure. If anything, every teacher should be over prepared. Good teachers are almost in a continuous state of preparation and planning. They are always thinking about the next lesson.

Make the Time to Plan

Teachers get a planning period at school, but that time is rarely used for "planning". Instead, it is often utilized to contact parents, conduct a conference, catch up on emails, or grade papers. True planning and preparation occur outside of school hours. Many teachers arrive early, stay late, and spend part of their weekends working to ensure that they are adequately prepared. They explore options, tinker with changes, and research fresh ideas in hopes that they can create the optimal learning environment.

Benefits of a Good Planner : An effective teacher is a good planner

Make you a better teacher : A significant part of planning and preparation is conducting research. Studying educational theory and examining best practices helps define and shape your own teaching philosophy. Studying the content that you teach in depth will also help you grow and improve.

Boost student performance and achievement : As a teacher, you should have the content that you teach mastered. You should understand what you are teaching, why you are teaching it, and you should create a plan for how to present it to your students every single day. This ultimately benefits your students.

Make the day go by faster : Downtime is a teacher's worst enemy. Many teachers use the term "free time". This is simple code for I did not take the time to plan enough. Teachers should prepare and plan enough material to last the entire class period or school day.

Minimize classroom discipline issues : Boredom is the number one cause of acting out. Teachers who develop and present engaging lessons on a daily basis rarely have classroom discipline issues. Students enjoy going to these classes because learning is fun.

Make you confident in what you do : Confidence is an important characteristic for a teacher to possess. If for nothing else, portraying confidence will help your students buy what you are selling. As a teacher, you never want to ask yourself if you could have done more to reach a student or group of students.

Help earn the respect of your peers and administrators : Teachers know which teachers are putting in the necessary time to be an effective teacher and which teachers are not. Investing extra time in your classroom will not go unnoticed by those around you. They may not always agree with how you run your classroom, but they will have a natural respect for you when they see how hard you work at your craft.

6.5.2. Functions of Teacher as Facilitator

You cannot teach a man anything; you can only help him discover it within himself– Galileo

The teacher occupies a central role in the whole teaching-learning process. In spite of the development of new types of mechanical and electronic teaching aids and an increased emphasis on pupil centered education, it is still the fact that it is the teacher who, after all has been said and done, can make education the most worthwhile human enterprise. The role of teachers is socially significant as it affects the knowledge, skills and attitude of future adults. Teacher expected to play many roles which may most important is teacher's role as a learning facilitator

This is a composite role that calls upon many facets of a teacher's abilities and common sense. It is difficult to quantify or define precisely, yet it is not difficult to recognize when it is occurring and to know when it is missing. It is one of the most crucial advances in developing a more complex visualization of teachers.

As a facilitator of learning : An effective teacher is an organizer of the group and facilitator of learning. A teacher can play the following roles to facilitate learning.

1) As facilitator of learning the teacher must be warm, understanding, and self-controlling
2) He must listen and accept students' feelings.
3) He must observe students' reactions closely.
4) He must listen attentively and accept the student's feelings and ideas.
5) He must ask questions to the students and praise and encourage them when necessary.
6) In his planning and execution of work, he must be responsible, business-like, systematic, flexible and work oriented.
7) Whenever he criticizes a student he must explain the reason for criticism.
8) He must be stimulating and imaginative in his approach to classroom behavior and subject.
9) To facilitate learning the teacher must encourage classroom discussion, panel discussion, and question and answer session.
10) Whenever necessary he must lecture, demonstrate, and explain things with examples. He must encourage independent study habits.

Six characteristics which identify teachers who are high facilitators of personal growth :

1. effective listening
2. genuineness
3. understanding
4. respect
5. intelligence
6. skill in interpersonal communication (Wittmer& Myrick, p. 40)

Effective Listener & Communicator

1. Good eye contact
2. Gives attention to what is being said - particular words, body language and non-verbal expressions, vocal tones, process and timing
3. Try to feel how the person is feeling and thinking
4. Attempt to become involved in how the speaker is perceiving the world
5. Express that you are listening, are following the ideas, are hearing what is being said

6. Send awareness of the person as a being with no judgmental overtones
7. Validate recognition by checking with the person or reflecting what was said
8. Listen to disclosures without rushing the person
9. Work to rescue true meanings and real needs as a part of listening

Genuineness

1. Direct personal encounter, person to person
2. Defensiveness or retreating are minimal and real sharing in maximized
3. Roles are recognized as roles and not used to distance one another
4. Feelings are admitted and recognized, those which are positive and those which are less comfortable but just as real - anger, sadness, weariness, joy, ennui, frustration, peace, need for solitude
5. Because human growth is developmental, there is a peace in letting be, in giving time to children to see things in different ways from our own
6. The right to disagree is valued, honored, and offered in peace.

When two men inform one another of their basically different views about an object, each aiming to convince the other of the rightness of his own way of looking at the matter, everything depends, so far as human life is concerned, on whether each thinks of the other as the one he is, whether each, that is, with all his desire to influence the other, nevertheless unreservedly accepts and confirms him in his being this man and in his being made in this particular way. The strictness and depth of the human individuation, the elemental otherness of the other, is then not merely noted as the necessary starting point, but is affirmed from the one being to the other. The desire to influence the other then does not mean the effort to change the other, to inject one's own "rightness" into him; but it means the effort to let that which is recognized as right, as just, as true (and for that very reason must also be established there, in the substance of the other), through one's influence, take seed and grow in the form suited in individuation (Buber, 1967).

Understanding

1. Empathy describes true understanding - becoming immersed in how a student feels rather than how we feel they may feel or should feel
2. Reading the clues and cues another sends and validating them
3. Perceive what is being expressed to eliminate defensive stances or withdrawal
4. Involve the student in learning to understand self, and move toward understanding others. — (this works better after a child is at least 7 and can become involved in second person perspective more readily)

Respectful

1. Accept a student's experiences as important to him/her
2. Practice respect of others as a part of the classroom system and process
3. Task analyze the times when students do not show respect to each other or the teachers to better set up the procedures, drills and skills which will enhance the use of respect with one another
4. This is often shown through optimism, deep interest and concern
5. Positive regard, warmth and respect will earn the respect of students, while demanding or punishing for respect will lead to anger and misbehavior

There is nothing produced by man more powerful than an idea, yet there is nothing at birth so delicate. An earthshaking idea could be murdered at birth by a smirk. It has been said that nothing can stop an idea whose time has come. The problem seems to be in its surviving until its time can come! - Theodore A. Cheney

Knowledgeable

1. Extensive knowledge of subjects taught
2. Love of knowledge and learning - with a desire to share the love and the skills
3. Knows when to expedite learning by sharing personal insights and when to allow student exploration and personal discovery
4. Becomes involved in learning about the cultural background of students

Mastery of the fundamental ideas of a field involves not only the grasping of general principles, but also the development of an attitude toward learning and inquiry, toward guessing and hunches, toward the possibility of solving problems on oneâs own. Just as a physicist has certain attitudes about the ultimate orderliness of nature and a conviction that order can be discovered, so a young physics student needs some working version of these attitudes if he is to organize his learning in such a way as to make what he learns usable and meaningful in his thinking. To instill such attitudes by teaching requires something more than the mere presentation of fundamental ideas. -Jerome Bruner

Communication for students :

Communication skills are very simple and straightforward sets of behaviors. Young people can be taught to communicate using these behaviors, and are quite good at doing so. Because of the pace of development of empathy and the ability to know and care how others feel, it does take a while for empathy and understanding to become an equal part of the communicating process. This does not suggest that teaching

children a set of skills will teach them to communicate, but it does suggest that the skills can be put in place and the other facets will come together over time and as a result of social and emotional development.

Teacher Power :

Coercive Power	Rewarding Power
1. Punitive acts	1. Responsibility for self
2. Negative acts	2. Privilege & choice
3. Scolding	3. Verbal praising the student as a person.
4. Belittling	4. Verbal praising of work
5. Inflicting pain-physical & emotional	5. Love warmth & respect.
6. Deprivation	6. Expression of belief on student's dignity.
7. No attention	7. Attention to students; need.

6.5.3. Functions of Teacher as Counselor

"The paradox of learning a really new competence is this: that a student cannot at first understand what he needs to learn, can learn it only by educating himself, and can educate himself only by beginning to do what he does not yet understand." - Schön (1990).

Taking the responsibility for a relationship role in teaching, gives teacher as counselor a new importance. The historic nature of this role can be traced at least as far back as Socrates. Repeatedly in the writings of Plato we see Socrates involved in assisting his students and followers in a counseling posture.

General Guidelines: From the perspective as discussed in Northern Arizona University we could place these guidelines–

- Effective helpers hold positive beliefs about people and recognize and establish a philosophy of human nature and the purpose of helping.
- We need to have healthy self-concepts and possess traits such as empathy, congruence, warmth, compassion, genuineness, unconditional positive regard for self / others.
- Helpers clarify who is responsible for change and how to facilitate change.
- We should be always interested in finding out about the way people behave.
- We should recognize that many child behaviors are developmental and meet a need, therefore we may change self or environment to meet the individual need rather than changing the child.

- Helpers recognize human nature and the need and right to positive and negative emotions.
- Since we need to recognize limitations of time and role, we frequently help with an immediate crisis or problem and then get appropriate assistance for long term, chronic or deeply involved issues.
- We should keep in mind that we do not counsel the family, but we do share information about good referrals.
- We grow in ability to counsel others through workshops and training, as available.

General Steps in Helping a Student

The focus is to provide a safe, secure and nurturing climate in which the child can grow as a healthy, whole individual.

1. Recognize the student's need for intervention and build rapport
2. Provide an appropriate time to truly listen to the child
3. Help the person identify and clarify the problem
4. Illuminate options and alternatives for problem solving
5. Help create goals to facilitate improvement or change
6. Encourage the student to succeed
7. Enhance child's perspectives, wellbeing through educating about the problem
8. Refer to others if in depth skills are needed
9. Keep the student's confidence sacrosanct unless abuse is involved or it is believed that the student might hurt self or others
10. Listen to the inner messages that come through interaction with the child

Conduct a life space interview assisting students to express themselves and see others' views. Accept the child's feelings without agreeing to inappropriate behaviors. Analyze problems for solutions using the following steps :

1. Help students see and accept reality, abandoning defensive positions
2. Assist student to see why the behaviors are self-defeating
3. Clarify values
4. Suggest behaviors to child for change if student does not supply them
5. Support students in self exploration to avoid problems with others
6. Assist the child to release anger through sympathy and understanding
7. Help students find alternative positive ways to express emotions like panic, rage, guilt rather than venting in destructive ways

8. Maintain open communications with friendly gestures and reminders
9. Clarify student thinking and decision making at crisis points.

Teacher power :

The power base for the counseling role comes primarily from Personal Power and involves two types of empowerment, referent power and information power. Referent power is the attractiveness which the teacher possesses in the eyes of students and others. The relationship between the teacher and the student has a major influence on the students' behaviors. Information power assists the teacher in influencing behavior. It is part of the confidence which students and parents gain as they perceive the teachers' ability to act as a center of information. Parents and students alike will be amenable to the teachers' programs if they believe the instructor possesses and disseminates unbiased information as well as being a valuable resource when called upon to assist with individual problems and concerns.

Teachers build these powers by :

Referent Power	Information Power
8. Build rapport with students	8. Draw parents into school involvement
9. Increase sense of charisma	9. Send positive messages about students to parents
10. Show students you are consistent	10. Be an active, responsive listener
11. Establish and maintain sense of trust	11. Show respect for self and students
12. Share sense of security by showing care for them and their problems	12. Cultivate "second person" perspectives
13. Maintain maturity rather than peership	13. Familiarize self with community referrals and resources and help parents with access

The frequency and gravity of problems met in counseling activity

According to notes, the most frequent problems met in school environment are from family, school, affective/sentimental, disciplinary and self-knowledge areas :

- School problems : school inadaptability, absenteeism, low school promotion and school abandon, difficulty of understanding children with learning difficulties who came from disadvantaged families or from Children Placement Centers, behavioral deficiencies as ADHD.
- Familial problems : students who came from familial backgrounds with very low socio-economic situations, students from single parent families, divorced parents, students who pass through difficult situations due to a parent's death,

students with emotional problems and its cause being family abandonment of one or both parents who left abroad to work, etc.

- Problems of sentimental nature : lack of affective response from those sentimentally invested by teenagers, disappointments, sentimental frustrations, different emotional expectations, physical and emotional abuses from partners.
- Identity and self-knowledge problems : self-searching, self-analysis, the need to understand his own identity, behaviors and personal expectations from others and themselves, analysis on personality development during teenage years, etc.
- Disciplinary problems : deriving from rules and regulations, bully acts, aggression towards opposite, self-aggression (suicide attempts), juvenile delinquency, and violence.
- Misjudged ideas, preconceptions : Even though this is not a problem in itself, this type of thinking is met at some parents, as well as some teachers, these considering that only those children who have "real" problems end up at a psychologist, followed by the fact that every child who needs the counselor's intervention to receive a negative label just because he goes to the counseling private practice. The implications of these prejudices represent one of the reasons why the quality of the teacher-student relation is demanding. The cases we dealt with include situations of certain gravity, most of these referring to abuses and violence, in school environments as well as at home. These manifestations are to be seen mostly at preadolescence and teenage

6.5.4. Functions of Teacher as Researcher

'Quality teaching' is undoubtedly acknowledged to be the most important school-level input having an impact on students' academic achievement. Such reality indicates the importance of teacher education, from initial training and induction for beginning teachers, to on-going professional development to help update teachers' knowledge, deepen their understanding and advance their skills as expert practitioners. Policy-makers in different countries have approached and adapted the task of teacher preparation and professional development in different ways, reflecting their distinctive values, beliefs and assumptions about the nature of professional knowledge. According to the simple concept of 'research', research is about answering questions with data and it is 'organized'. Reflective practice may not involve gathering data. How organized it is depends on the teacher, and it isn't usually focused on a particular issue. Thus the role of teacher as researcher is gaining importance.

The concept of teacher-as-researcher is included in recent literature on educational reform, which encourages teachers to be collaborators in revising curriculum, improving

their work environment, professionalizing teaching, and developing policy. Teacher research has its roots in action research

The National Policy on Education (NPE) 1986/92 recognized that "…teachers should have the freedom to innovate, to devise appropriate methods of communication and activities relevant to the needs of and capabilities of and the concerns of the community." (NPE-1986 / 1992)

Hence, the ability to conduct research to reflect practice is an essential component in professional development of teachers and teacher educators. Research-based teacher education has lately received increasing interest both among researchers of teacher education (Kansanen et al., 2000; Jakku-Sihvonen& Niemi, 2006, 2007) and in public discussion.

Research-based approach of teaching covers the activities of practicing inquiry and research which reflected from the following table as advocated by Toom et al., 2010 (Center for Research on Teaching, University of Helsinki):

LEVEL	TEACHING	RESEARCHING
GENERAL	● Metacognition ● Reflection Pedagogical thinking	● Producing ● Expertise
BASIC	● Every day thinking ● Skill based teaching ● Teaching recipes, routines, tips	● Adaption ● Consuming ● Knowledge based
	Making pedagogical decisions	**Inquiring one's own work**

When practice concerns teaching it is a question of making pedagogical decisions. Practice in research, in turn, implies inquiry into one's own work as a teacher. These both are the dimensions of research-based teacher education which aims at producing inquiry-oriented future teachers.

Importance of teacher-research :

The benefits of teacher-research can include:

a. For teachers :

- Becoming better able to understand and address teaching challenges
- Feeling more empowered and more motivated in their work

b. For learners :

- Enhanced engagement in learning
- Feeling more trusted, as partners in research

c. For the school or institution :

- Continuing professional development which meets teachers' specific needs
- Increased commitment from teachers

d. For a mentor :

- Supporting a process with clear value for participants
- Learning new skills, and gaining new knowledge

e. For the wider profession :

- Contributing to a new approach to knowledge generation
- Sharing of ideas for effectively addressing real teaching issues.

Action research is deliberate, solution-oriented investigation that is group or personally owned and conducted. It is characterized by spiraling cycles of problem identification, systematic data collection, reflection, analysis, data-driven action taken, and, finally, problem redefinition. The linking of the terms "action" and "research" highlights the essential features of this method: trying out ideas in practice as a means of increasing knowledge about and/or improving curriculum, teaching, and learning (Kemmis& McTaggart, 1982).

Very often action research is a collaborative activity where practitioners work together to help one another design and carry out investigations in their classrooms. Teacher action research is, according to John Elliott, "concerned with the everyday practical problems experienced by teachers, rather than the 'theoretical problems' defined by pure researchers within a discipline of knowledge" (Elliott, cited in Nixon, 1987). Research is designed, conducted, and implemented by the teachers themselves to improve teaching in their own classrooms, sometimes becoming a staff development project in which teachers establish expertise in curriculum development and reflective teaching.

The defining feature of teacher-research is that it is research carried out - and usually initiated voluntarily by teachers themselves into an issue that concerns them, for their own benefit and that of their students. It is therefore a form of practitioner research - research done by practitioners (who might include, for example, nurses, social workers, etc.) with the intention of understanding and perhaps improving their practice. Action research is practitioner research which seeks to effect change and evaluate the consequences.

Most teacher-research is centered on what happens in the teacher's own classroom, in other words it is a kind of classroom research or classroom-basedresearch. But if the project belongs to and is mainly carried out by an outside researcher, this isn't classroom-based teacher-research. Teacher-research, then, is practitioner research - usually, classroom-based research - which is initiated and carried out by and for teachers, for their own benefit and that of their students!

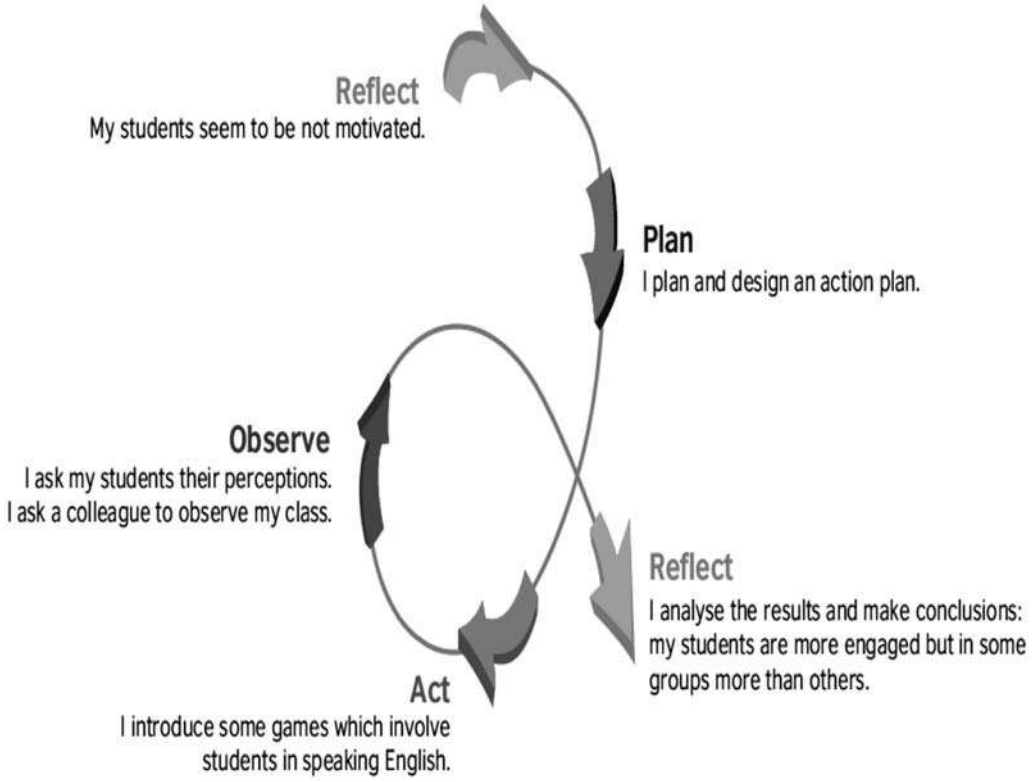
Stringer (1999) suggested the action research process works through three basic phases :

Look– Building a picture and gathering information. When evaluating the teacher (researcher) has to define and describe the problem to be investigated and the context in which it is set. He also has to describe what all the participants (educators, group members, educational administrators etc.) have been doing.

Think– Interpreting and explaining. When evaluating He/she has to analyze and interpret the situation. He/ she has to reflect on what participants have been doing. He/she must look at areas of success and any deficiencies, issues or problems.

Act– Resolving issues and problems. In evaluation the teacher (researcher) has to judge the worth, effectiveness, appropriateness, and outcomes of those activities. Teacher (researcher) acts to formulate solutions to any problems.

As discussed above, action research involves attempting to improve a situation via some kind of new action, and evaluating what does or does not change. This can then lead into a further cycle of attempted change and evaluation, and so on



Source: Smith, R. (2020). Mentoring teachers to research their classrooms: a practical handbook British Council, New Delhi, India

Therefore, a teacher has to follow a specific method for doing action research for his or her professional development. The concept of professional development of framework for teachers based on action research can be elaborate by following 'PEPP & ER' model as advocated by Peggy Leong (2004) where-

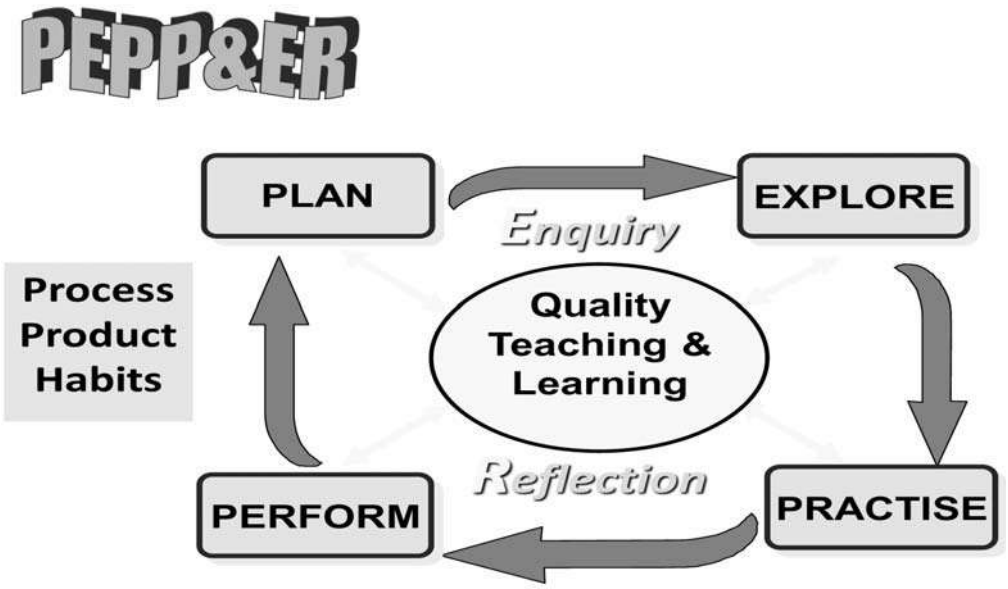
P stands for PLAN to improve the quality of teaching and learning

E stand for EXPLORE new and innovative strategies

P stand for PRACTICE - carry out the plan agreed upon and

P is stands for PERFORM - reflect on learning experience and share findings

This can be done by Enquiry and Reflection.



Source : Peggy Leong (2004), Embarking on a Learning Journey: Developing the PEPP & ER Framework for Action Research

Nature of Educational Action Research :

1. It is conducted by the practitioners who are involved in the object of research (like teachers or teacher educators who are engaged in the act of teaching some of the aspects of which are being researched)
2. It may be either individual and/or collaborative effort.
3. It is carried out within the confines of the social situation in which the participants are functioning, i.e. in an educational scenario such type of researchis conducted by the teachers within the school in which they are employed.

4. The method in such a type of research predominantly relies on self-reflection of the participant (researcher) rather than on rigorous statistical analysis.
5. It is practical and directly relevant to an actual situation in the working world of teachers. The subjects are the students in the classroom, the staff, or others who are primarily involved in the school.
6. It is flexible and adaptive, allowing changes during the trial period and sacrificing control in favour of responsiveness and on the spot experimentation and innovation.
7. As the situation is unique and the problem is unique so action research is situation based and context specific. Therefore, action research produces results which are not always generalizable.

Scope and purpose of Action Research in Education :

While teaching, the teacher is encountered with several problems for which he/she doesn't have any ready-made solutions. In the particular situation a befitting solution needs to be discovered by the teacher and hence he/she is led to conduct action research thereon. Therefore, action research has a wider scope in education.

Considering the view of Carr and Kemmis (1986), we can say there is lot of scope in following areas-

- the improvement of practice;
- the improvement of the understanding of practice;
- the improvement of the situation in which the practice takes place.

More analytically speaking, action research can serve the following purpose–

- Facilitates change in classrooms and schools
- Fosters disciplined and systematic inquiry
- Empowers individuals via collaborative teams
- Encourages reflection on practice
- Enhanced capacity of teacher to influence change
- Vehicle for creating professional learning communities
- Seeks to narrow gap between vision & practice

6.6 Summary

Every teacher operates according to a theory or theories of learning and within the context of a philosophy of what education should be fundamentally about. The only difference is that sometimes these theories are very consciously held and operated

upon by the teacher, perhaps carefully referenced to published theory in the field, while others are held and operated upon rather less consciously. We all know that teaching is a purposeful activity. Through teaching the teacher brings a desirable change in the learner. Both the concepts teaching and learning are interrelated to each other. Teachers teach students at three levels. They have to keep in mind the developmental stage of the learners so that desired educational objectives can be achieved. These three levels are

4. **Memory level :** Thoughtless teaching: It is concerned with memory or mental ability that exists in all living beings. Teaching at memory level is considered to be the lowest level of teaching.
5. **Understanding level :** Thoughtful teaching: The teaching at the understanding level is of a higher quality than the one at the memory level. It is more useful and thoughtful from the point of view of mental capabilities. At this level of teaching, the teacher explains to the student about the relationship between principles.
6. **Reflective level :** Upper thoughtful level: This level is also known as introspective level. Reflecting on something means giving careful thought to something over a period of time. It also means thinking deeply about something. Reflective level of teaching is considered to be the highest level at which teaching is carried out.

There are different types of Teaching Methods : Lecture, Demonstration, Problem Solving and Programme Instruction.

One of the most common alternatives used by those at the college level is communicating directly to the students where the talking by the teacher is the most predominant activity, and it is called 'lecture'. This teacher centered approach may take the form of two-way communication when the teacher talks with the students. In this way, the lecture becomes a question-answer or discussion activity instead of merely giving information.

Another teacher-controlled instructional technique widely used in higher education institutions is Demonstration. As college teachers, you may well be acquainted with the word 'Demonstration '. In colleges, teachers use demonstration very often, though teachers of other disciplines take recourse to demonstration when something related to teaching of skills comes.

Problem-based teaching method students are presented with authentic, meaningful problems as a basis for inquiry and investigation. Sometimes called project-based instruction, inquiry learning, or authentic investigation, this strategy is designed to promote problem solving and higher-level thinking skills. All problem-based instruction

strategies include more or less the following features: a driving question or problem, interdisciplinary focus, authentic investigation, production of artifacts or exhibits, and collaboration.

B F Skinner developed the Auto instruction Method which fashioned the base for Programmed Learning Programmed is a sequence of small steps of instructional material (called frames), most of which require a response to be made by completing a blank space in a sentence. To ensure that expected responses are given, a system of queuing is applied and each response is verified by the provision of immediate knowledge of the result. Such a sequence is intended to be worked at the learners own pace as individualized self-instruction. There are usually four Types of Programmed Instruction.

1. Linear or Extrinsic Programming
2. Branching or intrinsic Programming
3. Mathletics programming
4. Ruling System of programming

Teachers are planners. This is the essential role of successful teaching. Before all else, the teacher must develop a good 'flight plan', it must lay out a destination and the path to that destination. Planning is preparing a course of action to achieve specific objectives. There are three levels of planning. It covers curriculum planning, unit planning, lesson planning and time budget planning.

The teacher occupies a central role in the whole teaching-learning process. In spite of the development of new types of mechanical and electronic teaching aids and an increased emphasis on pupil centered education, it is still the fact that it is the teacher who, after all has been said and done, can make education the most worthwhile human enterprise. The role of teachers is socially significant as it affects the knowledge, skills and attitude of future adults. Teacher expected to play many roles which may be broadly categorized into two :

1. Role as a learning facilitator : An effective teacher is an organizer of the group and facilitator of learning.
2. Role as a learning organizer : Teachers need to play the role of organizer by adopting instruction, as an ideal model of social behavior and also as an artist in human.

Taking the responsibility for a relationship role in teaching, gives teacher as counselor a new importance. The teacher as counselor is a powerful role. The focus is to provide a safe, secure and nurturing climate in which the child can grow as a healthy, whole individual.

'Quality teaching' is undoubtedly acknowledged to be the most important school-level input having an impact on students' academic achievement. Such reality indicates the importance of teacher education, from initial training and induction for beginning teachers, to on-going professional development to help update teachers' knowledge, deepen their understanding and advance their skills as expert practitioners. Action research is deliberate, solution-oriented investigation that is group or personally owned and conducted. When practice concerns teaching it is a question of making pedagogical decisions. Practice in research, in turn, implies inquiry into one's own work as a teacher. These both are the dimensions of research-based teacher education which aims at producing inquiry-oriented future teachers.

6.7 Self-Assessment Questions

1. What is meant by level of teaching? Briefly explain the understanding level of teaching.
2. Explain reflective levels of teaching with any suitable model.
3. Briefly discuss the steps involved in effective lecture methods. Mention How lecture methods can be improvised.
4. Describe Major Characteristics and principles of Demonstration method.
5. What is Programmed Instruction? Explain Principles of Programmed Instruction65. Explain branching model of programme learning with a model
6. An effective teacher must be a good planner-justify the statement with reason.
8. Role of a teacher as a counselor is gradually evolving -explaining the responsibilities of the teacher as counselor.
9. Now, teaching is facilitating—explain the challenges a teacher faces as facilitator.
10. Mention the nature of action research. What is the importance of teacher research in education?

6.8 References

American Psychological Association (APA). (2001). Publication manual of the American Psychological Association (Fourth edition). Washington, DC: Author.

Buber, M. (1967). A believing humanism : My testament, 1902-1965.New York: Simon & Schuster.

Chauhan, S.S. (1989). Innovations in Teaching Learning Process. New Delhi: Vikas Publishing House Pvt. Ltd.

Creswell, J. W. (1994). Research design: Qualitative & quantitative approaches. Thousand Oaks, CA: Sage.

Crowder, N. A. (1957). A part-task trainer for troubleshooting (Vol. 57). Maintenance Laboratory, Air Force Personnel and Training Research Center, Air Research and Development Command.

Dumitru, G. (2015). Teacher's Role as a Counsellor. Procedia-Social and Behavioral Sciences, 180, 1080-1085.

Ellington, H. Percival, Fred and Race, Phil (2003). Handbook of Educational Technology. New Delhi: Kogan Page India Private Limited

Elliott, J. (1991). Action Research for Educational Change. Philadelphia: Open University Press.

Elliott, J. (1993). What have we learned from action research in school?based evaluation?.Educational Action Research, 1(1), 175-186

Fraenkel, J. R. & Wallen, N. E. (1990). How to design and evaluate research in education. New York: McGraw-Hill.

Fry, Healther, Ketteridge, S. and Marshall, S. (2003). A Handbook for Teaching and Learning in Higher Education. London:Kogan Page.

Herbart's Model of Memory Level Teaching

http://newlearningenvironments.com/our-role-as-educational-planner/ Accessed on November 24, 2021.

Hunt, D. E. (1971). Matching models in education: The coordination of teaching methods with student characteristics. Ontario Institute for Studies in Education, Monograph.

Jacobs, P. C. (1974). Modifying Impulsive Behavior of Second-Grade Boys Through Cognitive Self-Instruction: Intensity of Training Related to Generality and Long Range Effects. Wayne State University.

Jagtap, P. (2015). Teachers' role as facilitators in learning. Scholarly Research Journal for Humanity Science and English Language, 3(17), 3901-3906.

Jakku-Sihvonen, R. & Niemi, H. (Eds.) (2006). Research-based teacher education in Finland: Reflections by Finnish teacher educators. Finnish Educational Research Association. Research in educational sciences 25.

Jakku-Sihvonen, R. & Niemi, H. (Eds.) (2007). Education as a societal contributor: Reflections by Finnish educationalists. Frankfurt am Main: Peter Lang.

J'Anne Ellsworth (2001), Center for Technology Enhanced Learning Teaching Role. Northern Arizona University.

Kansanen, P., Tirri, K., Meri, M., Krokfors, L., Husu, J., &Jyrhämä, R. (2000). Teachers´ pedagogical thinking. Theoretical landscapes, practical challenges. New York, Peter Lang.

Kemmis, S., & McTaggart, R. (1982). The Action Research Planner. Victoria: Deakin University Press.

Krathwohl, D. R. (1988). How to prepare a research proposal: Guidelines for funding and dissertations in the social and behavioral sciences. Syracuse, NY: Syracuse University Press.

Leith, G.O.M. (1966). A Handbook of Programmed Learning (2nd Ed.). Educational review Occasional Publication. No 1, University of Birmingham, U.K.

Leong, P. (2004, August). Embarking on a Learning Journey: Developing the PEPP & ER Framework for Action Research. In the International Research Conference on Vocational Education and Training,(Ministry of Education, Thailand, The Federation of Private Vocational Schools of Thailand & UNESCO 13-14 Aug 2004).

Lewin, K. (1948). Resolving Social Conflicts. New York, Harper.

Lowman, Joseph (1984). Mastering the Techniques of Teaching. San Francisco: Jossey-Bass Inc.

McNiff, J. (1988). Action Research: Principles and Practice. London: Macmillan Education.

McNiff, J. and Whitehead, J. (2002) Action Research: Principles and Practice (2nd ed.), London: RoutledgeFalmer.

Nixon, J. (1987). The teacher as researcher: Contradictions and continuities. Peabody Journal of Education, 64(2), 20-32. https://doi.org/10.1080/01619568709538549.

School of Education (2003). ES-33 I : Curriculum and Instruction, Block-2 : Instructional System, IGNOU: New Delhi.

Schön, D. A. (1990), Educating the Reflective Practitioner, p. 93, Jossey-Bass.

Sharma, G.D. and Shakti, R. Ahmed (1986). Methodologies of Teaching in Colleges, New Delhi: NIEPA.

Singh, Amrik (1995). The Craft of Teaching. (ed.) New Delhi: Konark Publishing House.

Skinner, B. F. (1986). What is wrong with daily life in the Western world? American Psychologist, 41(5), 568-574. https://doi.org/10.1037/0003-066X.41.5.568

Smith, R. (2020). Mentoring teachers to research their classrooms: a practical handbook, British Council, New Delhi, India.

Stringer, K. (1999) Study into the accommodation needs for young people requiring nursing home level of care. Melbourne: Melbourne City Mission.

Teachers' Network (Ministry of Education, Singapore) publication on Learning Circles

Toom, A., Kynäslahti, H., Krokfors, L., Jyrhämä, R., Byman, R., Stenberg, K., ... &Kansanen, P. (2010). Experiences of a Research?based Approach to Teacher Education: suggestions for future policies. European Journal of Education, 45(2), 331-344.

Vedanayagam, E.G. (1988). Teaching Technology/or College Teachers, New Delhi:Sterling Publishers Private Ltd.

Wiersma, W. (1995). Research methods in education: An introduction (Sixth edition). Boston: Allyn and Bacon.

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