SOLVING THE DIFFICULTIES OF LEARNING PROBLEM IN ORGANISATION OF PLANT TISSUES FOR NINETH STANDARD STUDENTS

ACTION RESEARCH REPORT

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Submitted To

STATE COUNCIL OF EDUCATIONAL RESEARCH AND TRAINING, CHENNAI-6

March-2024

DECLARATION

` I hereby declare that Action Research entitled **"SOLVING THE DIFFICULTIES OF LEARNING PROBLEM IN ORGANISATION OF PLANT TISSUES FOR NINETH STANDARD STUDENTS",** is submitted by me to the SCERT Chennai in the year 2023-2024 is the result of our original and independent Action Research work carried out under the co-ordination of Dr V. Hemalatha, Principal, DIET, Krishnagiri. This work has not submitted earlier for completing any Action Research work or other similar titles in this or any other institution.

March -2024

Signature of the Action Researcher

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Certified that this Action Research work entitled **"SOLVING THE DIFFICULTIES OF LEARNING PROBLEM IN ORGANISATION OF PLANT TISSUES FOR NINETH STANDARD STUDENTS",** is done by Mr.P.Madhu, Senior Lecturer, DIET, Krishnagiri, the report has been submitted to State Council of Educational Research and Training, Chennai-6.

Principal

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SOLVING THE DIFFICULTIES OF LEARNING PROBLEM IN ORGANISATION OF PLANT TISSUES FOR NINETH STANDARD STUDENTS

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ABSTRACT

The study aimed to address the challenges faced by ninth standard students in comprehending the organization of plant tissues. Through a Signal Group Experimental Method, involving 34 students from GHS, Karagur, the research utilized a Questionnaire for Pre-test and Post-test to gauge the effectiveness of the intervention. The intervention primarily comprised activity-based learning, including demonstrations of simple experiments elucidating plant tissue concepts such as Microscopy Observation, Cross-Section Preparation, and Tissue Dissection. The findings revealed significant improvement, with the mean pre-test score rising from 59.17 to 86.79 in the post-test. Additionally, the study concluded that ninth standard students had successfully grasped various aspects: Different types of tissues and their morphology, Patterns of tissue organization leading to organ formation, The roles of tissues in plant life activities,
Structural organization of tissues And Processes, types, and significance of plant tissue functionalities. This suggests that activity-based learning, coupled with experimental demonstrations, effectively enhanced the understanding of plant tissue organization among ninth standard students.

Keywords: Plant tissues**,** skills and ICT

Introduction:

Plant tissues play a crucial role in the growth, development, and functioning of plants. However, understanding the organization of plant tissues can pose challenges for ninth standard students due to the complexity of plant structures and functions. To address these learning difficulties, it is essential to develop effective teaching strategies tailored to the needs of students at this level.

This endeavour involves creating engaging lesson plans, utilizing visual aids, and implementing interactive activities to enhance students' understanding of plant tissue organization. By incorporating hands-on learning experiences and real-life examples, educators can make the subject more relatable and accessible to students.

Need for the study:

During the school visit in Krishnagiri Educational district, the practitioner observed ninth standard students. In most of the schools, the students lacked clarity about plant tissues and struggled to understand the different types of tissues and their morphology. The aim is to help students overcome these learning difficulties in the organization of plant tissues. Therefore, the action researcher selected this topic for further investigation and intervention.

Objectives:

1. To know the different types of tissues and their morphology.
2. To identify how tissues are organized in specific patterns to form organs.
3. To understand how tissues, perform life activities in plants.
4. To gain knowledge about the structural organization of tissues.

Sample:

The study sample consisted of 34 students enrolled in the ninth standard at GHS, Karagur

Tool:

Questionnaire for Pre-test and Post-test

Methodology:

Signal group experimental method

INTERVENTION-Activity

Demonstration of simple experiments to teach plant tissue

- Microscopy Observation, Cross-Section Preparation and Tissue Dissection

Findings:

- The mean value of the pre-test has increased from 59.17 to 86.79 to the post-test.

1. The IX standard students have understood the different types of tissues and their morphology.
2. The IX standard students have Identified how tissues are organized in specific patterns to form organs
3. The IX standard students have Understand how tissues perform life activities in plants.
4. The IX standard students have Gained knowledge about the structural organisation
5. The IX standard students have familiarized with the process, types and significance

Conclusion:

The conclusion of the study highlights the successful alignment of classroom activities with the stated objectives. Through the implementation of these activities, students were able to achieve a deeper understanding of plant tissues and related concepts. The outcomes of the study indicate that: Students have gained knowledge about the various types of tissues and their morphology, enabling them to identify and differentiate between them effectively. They have developed an understanding of how tissues are organized in specific patterns to form organs, recognizing the structural complexities involved in plant anatomy. Students now comprehend how tissues perform vital life activities in plants, such as photosynthesis, nutrient transport, and growth regulation. They have acquired knowledge about the structural organization of tissues, including their cellular composition and arrangement within plant structures. Students are now familiar with the process, types, and significance of cell division in plant growth and development, enhancing their grasp of plant physiology. Overall, the study demonstrates the effectiveness of tailored classroom activities in achieving the intended learning outcomes related to plant tissues and biology

SOLVING THE DIFFICULTIES OF LEARNING PROBLEM IN ORGANISATION OF PLANT TISSUES FOR NINETH STANDARD STUDENTS

1. INTRODUCTION:

Plant tissues play a crucial role in the growth, development, and functioning of plants. However, understanding the organization of plant tissues can pose challenges for ninth standard students due to the complexity of plant structures and functions. To address these learning difficulties, it is essential to develop effective teaching strategies tailored to the needs of students at this level.

This endeavour involves creating engaging lesson plans, utilizing visual aids, and implementing interactive activities to enhance students' understanding of plant tissue organization. By incorporating hands-on learning experiences and real-life examples, educators can make the subject more relatable and accessible to students.

Additionally, providing ample opportunities for practice, reinforcement, and feedback can help solidify students' grasp of plant tissue concepts. Teachers may also employ mnemonic devices, concept maps, and other mnemonic strategies to aid in memory retention and recall.

Through targeted interventions and a student-cantered approach, educators can empower ninth standard students to overcome learning obstacles and develop a deeper appreciation for the intricate organization of plant tissues.

Plant Tissues

Tissues are groups of cells that work together to perform specific functions within an organism. In plants, tissues are collections of specialized plant cells that

collaborate to carry out particular tasks essential for the survival and growth of the plant. These tissues combine to form different structures like leaves, stems, roots, flowers, and fruits, enabling plants to perform various functions necessary for their existence.

Classification of Plant Tissues

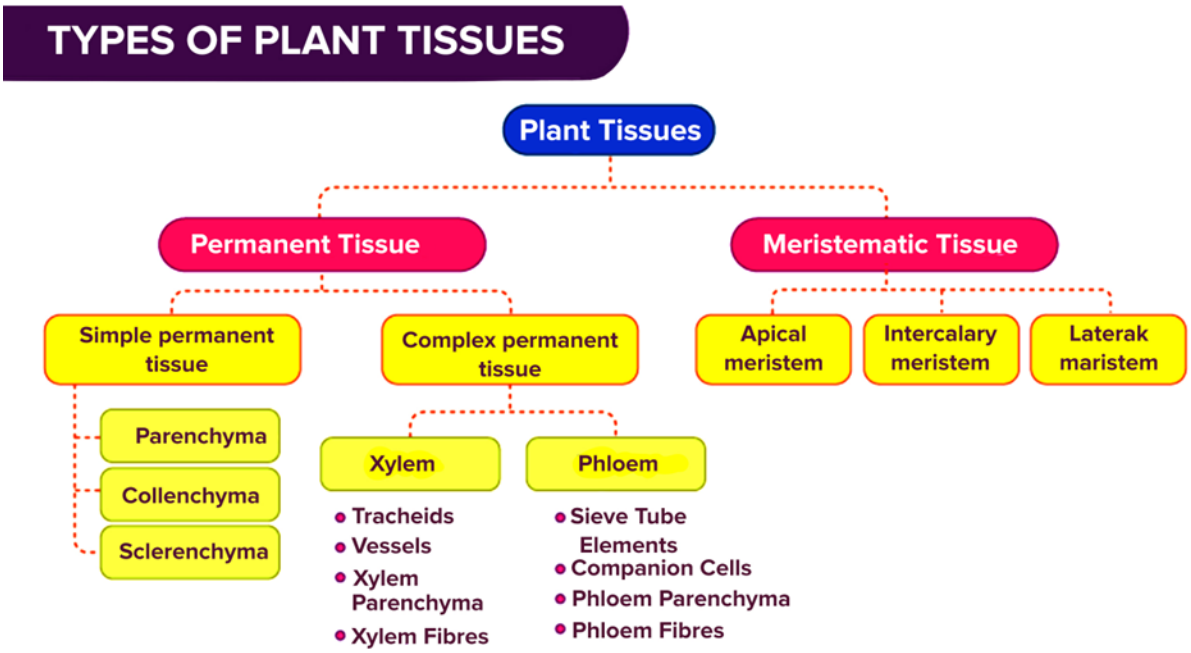
There are two main types of plant tissues: meristematic tissues and permanent (non-meristematic) tissues. They are further classified into subtypes.

Meristematic Tissues

Meristematic tissues are regions of actively dividing and rapidly growing cells found in plants. They serve as the source of new cells and play a fundamental role in plant growth and development. Meristematic tissues are responsible for the continuous growth of plants in length and girth, enabling them to increase in size and complexity. These tissues are particularly prominent in growing parts of the plant, such as the tips of stems and roots.

Key characteristics of meristematic tissues include:

a) Cell Division: Meristematic tissues consist of cells that are actively undergoing cell division that leads to the production of new cells, allowing the plant to grow and develop.



b) Undifferentiated Cells: Meristematic cells are undifferentiated, meaning they have not yet specialized into specific cell types. As they divide, some of these cells remain in the meristem, while others undergo differentiation to become specialized cells for various plant tissues.

c) Rapid Growth: The cells produced by meristems are initially small and have thin cell walls, which allows them to expand and elongate quickly.

d) Location: Meristematic tissues are primarily found in specific regions of the plant, such as the apical meristems (tips of stems and roots) and lateral meristems (sides of stems and roots). Intercalary meristems are also found in some plants, particularly and are located at the base of leaf blades and nodes.

Apical Meristem

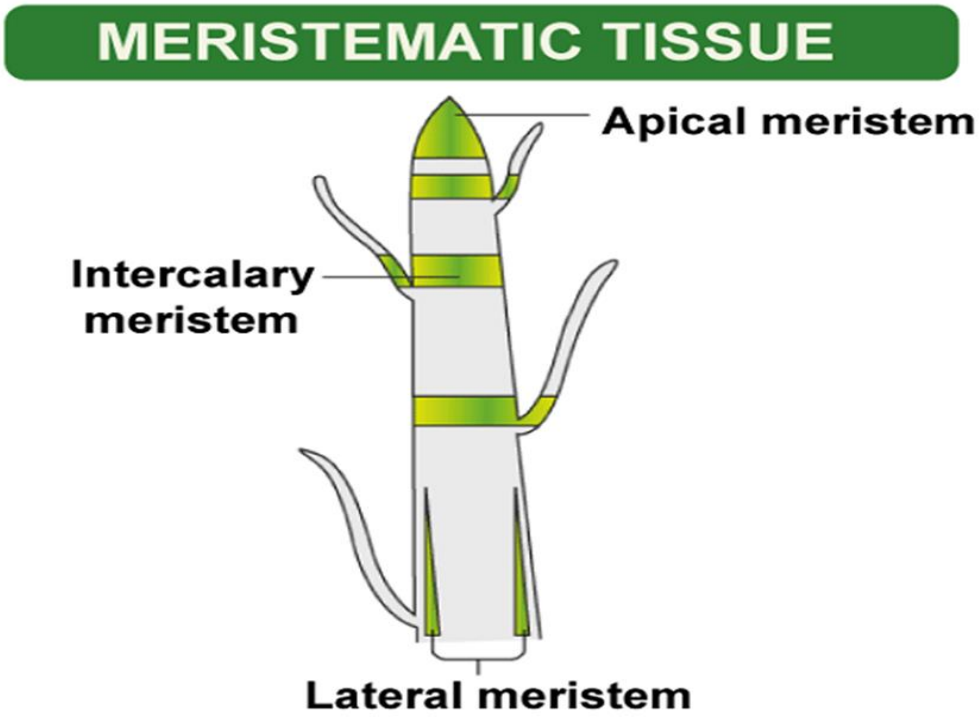
Apical meristem is a specialized type of plant tissue located at the growing tips of stems and roots. It plays a crucial role in the primary growth of plants, which involves the increase in the length of the plant body. The apical meristem is

responsible for the formation of new cells through a process called mitosis, where a single cell divides into two identical daughter cells. These new cells can further differentiate into various types of plant tissues, ultimately leading to the growth and development of the plant.

Key features of apical meristems:

a) Location: Apical meristems are found at the tips of both roots and stems. In stems, they're commonly referred to as shoot apical meristems, while in roots, they're known as root apical meristems.

b) Growth in Length: The primary function of apical meristems is to promote the elongation of stems and roots. This lengthening occurs through continuous cell division at the meristem, leading to the addition of new cells to the plant body.



c) Cell Differentiation: As cells produced by the apical meristem undergo division, they also differentiate into specialized cell types that will contribute to various plant

tissues. These tissues include dermal, ground, and vascular tissues, which collectively form the structural components of the plant.

d) Protection: The delicate apical meristem is often protected by young leaves or root caps. These protective structures help shield the meristem from damage as the plant grows and interacts with its environment.

e) Developmental Zones: Apical meristems can be divided into distinct zones based on cell activity. The zone of cell division contains actively dividing cells. The zone of elongation is where newly formed cells start to elongate, contributing to the increase in the length of the stem or root. The zone of maturation is where cells differentiate into specific tissue types.

Lateral Meristem

Lateral meristem is a specialised type of plant tissue that is located along the lateral sides of stems and roots. Unlike apical meristems, which are responsible for increasing the length of plant structures, lateral meristems are responsible for increasing the girth or thickness of stems and roots. This process is known as secondary growth and is particularly important in woody plants, allowing them to become thicker over time.

Key features of lateral meristems:

a) Location: Lateral meristems are found within the mature tissues of stems and roots, specifically along their lateral sides. They are responsible for the increase in diameter of the plant body.

b) Secondary Growth: Lateral meristems are responsible for secondary growth, which occurs after primary growth (elongation) and typically starts in older plants.

This type of growth leads to the thickening of stems and roots, contributing to the overall structural stability of the plant.

c) Two Types: There are two main types of lateral meristems: the vascular cambium and the cork cambium.

- **Vascular Cambium:** The vascular cambium is responsible for producing secondary xylem (wood) and secondary phloem, which add layers of tissue to the inside of the stem. The secondary xylem provides structural support and contributes to water transport, while the secondary phloem transports nutrients.
- **Cork Cambium:** The cork cambium produces cork cells, which form a protective outer layer that provides protection against physical damage, pathogens, and water loss in older roots.

d) Growth Rings: The activity of lateral meristems leads to the formation of growth rings in woody stems. Each year, a new layer of secondary xylem is added to the stem, creating visible rings. These rings can be used to estimate the age of the tree and provide information about its growth history.

e) Bark Formation: The accumulation of cork cells produced by the cork cambium contributes to the formation of bark.

f) Environmental Factors: The activity of lateral meristems can be influenced by environmental factors such as temperature and day length. This is why the width of growth rings can vary from year to year in response to changing conditions.

Intercalary Meristem

Intercalary meristem is a specialised type of plant tissue located at the base of leaves or internodes in some plants. Unlike apical and lateral meristems, which are

commonly found at the tips of stems and roots or along their sides, intercalary meristems are specific to certain regions of the plant where they contribute to growth and development in distinct ways.

Key features of intercalary meristem:

a) Location: Intercalary meristems are typically found at specific regions within the stem, often at the base of leaves or internodes (the segments of the stem between nodes). They can also occur at the base of leaf blades in some plants.

b) Role in Growth: The primary function of intercalary meristem is to contribute to the elongation of plant structures. This type of meristem is responsible for the increase in length between nodes (internodal elongation) or the elongation of leaf blades.

c) Grass Growth: Intercalary meristems are well-known for their role in the growth of grasses. In grasses, the base of each leaf blade contains an intercalary meristem. This allows the grass to grow rapidly from its base, making it well-suited for grazing animals.

d) Regenerative Ability: Intercalary meristems contribute to the plant's regenerative ability. For example, if a grass leaf is cut or grazed by an animal, the intercalary meristem at its base can continue to grow and elongate, allowing the grass to quickly recover its lost tissue.

e) Inhibition by Apical Meristem: In some cases, the activity of intercalary meristems can be inhibited by the presence of active apical meristems at the tips of stems. When the apical meristem is actively growing, it can suppress the growth of intercalary meristems, directing the plant's resources toward elongating the main stem rather than individual leaves.

Permanent Tissues

Permanent tissue is a type of plant tissue that is derived from meristematic tissue through a process called differentiation. Unlike meristematic tissues, which consist of actively dividing cells, permanent tissues are composed of cells that have ceased division and have taken on specific roles, shapes, and functions within the plant. Permanent tissues contribute to the overall structure, support, and functioning of the plant.

Key characteristics of permanent tissues:

a) Origin: Permanent tissues originate from meristematic tissues, which are responsible for cell division and growth. As meristematic cells divide, some of them undergo differentiation, transitioning into specialised cell types with specific functions.

b) Lack of Division: Once cells undergo differentiation and become part of permanent tissues, they lose the ability to divide further. This is in contrast to meristematic cells, which continually divide to contribute to the plant's growth.

c) Types of Permanent Tissues: Permanent tissues are categorized into two main types based on their complexity: simple permanent tissues and complex permanent tissues.

- **Simple Permanent Tissues:** These tissues are composed of cells that have similar structures and functions. Simple permanent tissues are further divided into three types: parenchyma, collenchyma, and sclerenchyma.
- **Complex Permanent Tissues:** These tissues are composed of multiple cell types that work together to perform specific functions. The two main types of complex permanent tissues are the xylem and phloem.

I. Simple Permanent Tissues

Simple permanent tissues are plant tissues composed of a single type of cell that serves specific functions within the plant. These tissues play essential roles in various plant processes and contribute to the overall structure and function of the plant. There are three main types of simple permanent tissues: parenchyma, collenchyma, and sclerenchyma.

1. Parenchyma

a) Structure: Parenchyma cells are relatively simple in structure, with thin and flexible primary cell walls. They have a large central vacuole and a prominent nucleus. Parenchyma cells are closely packed with intercellular spaces between them.

b) Intercellular Spaces: Parenchyma cells are loosely packed, leaving large intercellular spaces between them. This arrangement facilitates gas exchange and movement of water and nutrients.

c) Metabolically Active: Parenchyma cells are metabolically active and can undergo division, growth, and differentiation as needed.

d) Function: Parenchyma tissue serves multiple functions, including photosynthesis, storage of nutrients (such as starch), gas exchange, and wound healing. Parenchyma cells are found in various plant organs, including leaves, stems, roots, and fruits.

e) Example: Mesophyll cells in leaves are parenchyma cells responsible for photosynthesis.

2. Collenchyma

a) Structure: Collenchyma cells have unevenly thickened primary cell walls, which provide mechanical support and flexibility. The thickening occurs at the corners of the cells, creating a flexible framework.

b) Living Cells: Unlike some other types of plant tissues, collenchyma cells remain alive even after they have matured. This feature enables them to adapt to mechanical stresses and environmental changes.

c) Intercellular Spaces: Collenchyma cells have little to no intercellular spaces, which means they are densely packed together. This close arrangement enhances their supportive function.

d) Function: Collenchyma tissue provides structural support to young and growing plant parts, such as stems and leaves. It allows these parts to elongate while maintaining strength and flexibility.

e) Example: The strings of celery are made up of collenchyma cells that provide support to the stem.

3. Sclerenchyma

a) Structure: Sclerenchyma cells have thick, lignified secondary cell walls that provide rigidity and strength. These walls make the cells rigid and inelastic. There are two main types of sclerenchyma cells: sclereids and fibres.

b) Lack of Intercellular Spaces: Similar to collenchyma, sclerenchyma also lacks intercellular spaces. This dense packing of cells further enhances the tissue's structural integrity.

c) Cell Vitality: Unlike other living plant cells, sclerenchyma cells are dead at maturity. However, their tough cell walls continue to contribute to the plant's structural support.

d) Types of Sclerenchyma:

- **Fibers:** Long, slender cells that form bundles, providing tensile strength to plant tissues. Examples include flax and jute fibres used for textiles.
- **Sclereids:** Short, irregularly shaped cells that may have various functions such as protection or support. They are found in seed coats, nutshells, and fruit pits.

e) Function: Sclerenchyma tissue offers mechanical support and protection to mature plant structures. Sclereids are responsible for providing protection, while fibres contribute to the strength of plant tissues.

f) Example: The gritty texture of pear flesh is due to the presence of sclereids.

II. Complex Permanent Tissues

Complex permanent tissues consist of different types of cells that work together to perform specific functions vital for the survival and growth of plants. These tissues are involved in essential processes such as the conduction of water, minerals, and organic nutrients throughout the plant. The two main types of complex permanent tissues are xylem and phloem.

The xylem and phloem together form vascular bundles that run through the plant, ensuring the efficient transport of water, nutrients, and organic compounds. These complex permanent tissues play a crucial role in maintaining the plant's physiological processes, growth, and overall survival.

1. Xylem

The xylem is a complex tissue in plants that plays a crucial role in the transport of water, minerals and dissolved nutrients from the roots to other parts of the plant, including the stems and leaves. It is responsible for maintaining the plant's water

balance, providing structural support, and facilitating the movement of important substances necessary for growth and metabolism. Xylem tissue consists of several distinct cell types that work together to ensure the efficient conduction of water and nutrients throughout the plant.

Components of Xylem

a) Tracheids: Tracheids are elongated, tapered cells with lignified secondary cell walls. They have pits, which are areas of thinner cell walls that allow water movement between adjacent tracheids. Tracheids are present in various types of plants, including both angiosperms and gymnosperms.

b) Vessels: Vessels are wider, shorter cells formed by the alignment of vessel elements. Vessel elements are specialized cells with perforated end walls called perforation plates. These plates allow uninterrupted water flow through the vessels. Vessels are found mainly in angiosperms, contributing to their efficient water-conducting capabilities.

c) Xylem Parenchyma: These are living cells found interspersed among tracheids and vessels. Xylem parenchyma cells store starches, oils, and other nutrients, and they also play a role in lateral water movement within the xylem tissue. They help maintain the vitality of the surrounding cells and participate in tissue repair.

d) Xylem Fibres: Xylem fibres are elongated cells with thick walls composed of lignin, making them rigid and supportive. They contribute to the mechanical strength of the plant, especially in woody plants. Xylem fibres help prevent collapse of the xylem vessels and provide structural integrity.

Function of Xylem

The primary function of xylem tissue is to transport water and dissolved minerals from the roots to the aerial parts of the plant. This process is essential for various physiological processes, including photosynthesis, nutrient uptake, and maintenance of turgor pressure. The movement of water through the xylem is driven by a combination of transpiration, cohesion, and adhesion:

a) Transpiration: Water loss through small openings called stomata on the leaves creates negative pressure within the leaves. This negative pressure, also known as tension, pulls water upwards from the roots through the xylem vessels.

b) Cohesion and Adhesion: Water molecules in the xylem are cohesive, meaning they are attracted to each other. Additionally, water molecules adhere to the walls of the xylem cells. This cohesion and adhesion create a continuous column of water within the xylem vessels, allowing water to be pulled up the plant against gravity.

2. Phloem

Phloem is another complex tissue in plants that has a crucial role in the transportation of organic nutrients, primarily sugars produced through photosynthesis, from the leaves to other parts of the plant, including the roots, stems, and developing fruits. Unlike the xylem, which conducts water and minerals in one direction (roots to shoots), phloem is responsible for the bi-directional transport of nutrients, allowing the distribution of essential resources to different parts of the plant as needed.

Components of Phloem

a) Sieve Tubes: Sieve tubes are the main conducting cells of the phloem and are formed by the alignment of sieve elements. These cells have perforated end walls

called sieve plates that allow the movement of nutrients between adjacent cells. Sieve tubes lack most cellular organelles, including a nucleus, in their mature state, which allows for efficient nutrient transport.

b) Companion Cells: Companion cells are closely associated with sieve tubes and provide metabolic support to them. They have active nuclei and a full complement of organelles, which help regulate and maintain the functions of sieve tubes. Companion cells are responsible for loading sugars into sieve tubes at the source (usually leaves) and unloading them at the sink (areas of the plant where sugars are utilized or stored).

c) Phloem Fibers: Similar to xylem fibres, phloem fibres are elongated cells with thick walls made of lignin. They provide mechanical support and contribute to the structural integrity of the phloem tissue.

d) Phloem Parenchyma: These are living, specialized cells interspersed within the phloem tissue. Phloem parenchyma cells store and transport nutrients like starches and oils. They also assist in the overall functioning of the phloem by maintaining the metabolic needs of adjacent cells.

Function of Phloem

The main function of phloem tissue is the transportation of photosynthetically produced sugars (primarily sucrose) from the sites of production (source) to areas of growth, storage, or utilization (sink) in the plant. This translocation of nutrients is driven by a process known as "pressure flow" or "mass flow." It involves the active transport of sugars from source cells into sieve tubes and the subsequent movement of these sugars along the concentration gradient from source to sink. This movement is facilitated by the continuous flow of water within the plant and the difference in osmotic pressure between the source and the sink.

Phloem also plays a role in long-distance signalling within plants, as well as in the transport of hormones and other signalling molecules. The ability of phloem to transport materials in both directions allows the plant to allocate resources efficiently based on its physiological needs.

2. NEED AND SIGNIFICANCE OF THE STUDY:

Plants are multicellular eukaryotes with tissue systems made of various cell types that carry out specific functions. Plant tissues are composed of cells that are similar and perform a specific function. Together, tissue types combine to form organs. Each organ itself is also specific for a particular function.

Plant tissue systems fall into one of two general types: meristematic tissue, and permanent (or non-meristematic) tissue. Cells of the meristematic tissue are found in **meristems**, which are plant regions of continuous cell division and growth. Meristematic tissue cells are either undifferentiated or incompletely differentiated, and they continue to divide and contribute to the growth of the plant. In contrast, permanent tissue consists of plant cells that are no longer actively dividing.

Meristematic tissues consist of three types, based on their location in the plant. **Apical meristems** contain meristematic tissue located at the tips of stems and roots, which enable a plant to extend in length. **Lateral meristems** facilitate growth in thickness or girth in a maturing plant. **Intercalary meristems** occur only in monocots, at the bases of leaf blades and at nodes (the areas where leaves attach to a stem). This tissue enables the monocot leaf blade to increase in length from the leaf base; for example, it allows lawn grass leaves to elongate even after repeated mowing.

Meristems produce cells that quickly differentiate, or specialize, and become permanent tissue. Such cells take on specific roles and lose their ability to divide further. They differentiate into three main types: dermal, vascular, and ground tissue. Dermal tissue covers and protects the plant. The ground tissue serves as a site for photosynthesis, provides a supporting matrix for the vascular tissue, and helps to store water and sugars. The vascular tissue transports water, minerals, and sugars to different parts of the plant. Ground tissue is a **simple tissue**, meaning that each ground tissue consists of only one cell type. Dermal and vascular tissues are **complex tissues** because they consist of multiple cell types.

During the school visit in Krishnagiri Educational district, the practitioner observed ninth standard students. In most of the schools, the students lacked clarity about plant tissues and struggled to understand the different types of tissues and their morphology. The aim is to help students overcome these learning difficulties in the organization of plant tissues. Therefore, the action researcher selected this topic for further investigation and intervention.

3. STATEMENT OF THE PROBLEM:

The problem statement focuses on addressing the specific learning obstacles faced by ninth standard students concerning the organization of plant tissues. It aims to identify the root causes of these difficulties, explore effective teaching methodologies, and develop targeted interventions to enhance students' comprehension and retention of plant tissue concepts. By tackling these challenges, educators can facilitate a more engaging and effective learning experience, ultimately empowering students to achieve better academic outcomes in plant biology. Hence the action research is entitled as **“SOLVING THE DIFFICULTIES OF**

LEARNING PROBLEM IN ORGANISATION OF PLANT TISSUES FOR NINETH STANDARD STUDENTS"

5. OBJECTIVES OF THE STUDY:

The objectives of the study are clearly understood by the action researcher. Therefore, relevant activities in the classroom have been undertaken by the action researcher to align with the following objectives:

5. To know the different types of tissues and their morphology.
6. To identify how tissues are organized in specific patterns to form organs.
7. To understand how tissues, perform life activities in plants.
8. To gain knowledge about the structural organization of tissues.
9. To get familiarized with the process, types, and significance of cell division.

6. PROBABLE CAUSES:

Students are unable to understand the Biological terms of tissues

- Lack of Previous knowledge to know the tissues and their morphology.
- May be due to the lack of knowledge to identify the types of tissues in plants
- lack of interest to read how tissues perform life activities in plants.
- May be due to the inappropriate method used by the Science teachers.
- Proper teaching learning materials which are not Provided by the concern subject teacher in classroom activities.
- Insufficient technically sound environment in school campus.

7. HYPOTHESES:

- There is no significant difference between pretest and post test scores.

8. DESIGN OF THE STUDY:

Single Group experimental design.

9. SAMPLE OF THE STUDY

The study sample consisted of 34 students enrolled in the ninth standard at GHS, Karagur.

9. TOOL FOR THE STUDY (Achievement test)

The practitioner constructed the multiple choice based objective type question as an achievement test. The tool was established content validity in consultation with the subject teachers and same was found reliability with split half method. Each question carries one mark for the correct answer. The raw data are converted into 100 for analysis of the data. **The r value of the tool was found to be 0.89.**

10. IMPLEMENTED ACTION PLAN

1. PRE-TEST

The practitioner conducted the pre-test to find out the initial level of knowledge on tissue, morphology and types of plant tissue.

2. MOTIVATION

The practitioner had motivated the students to draw the attention of the students to lean the concept of plant tissue.

- How do plant tissues contribute to the growth and development of plants?

- Can you imagine a world without different types of plant tissues? How would it impact life on Earth?
- What role do plant tissues play in the adaptation of plants to their environment?
- How can knowledge of plant tissues help us in fields like agriculture, horticulture, and biotechnology?
- What are some real-world examples where understanding plant tissues is crucial for solving problems or making advancements?

These questions are designed to spark curiosity, engage students, and highlight the relevance and significance of studying plant tissues.

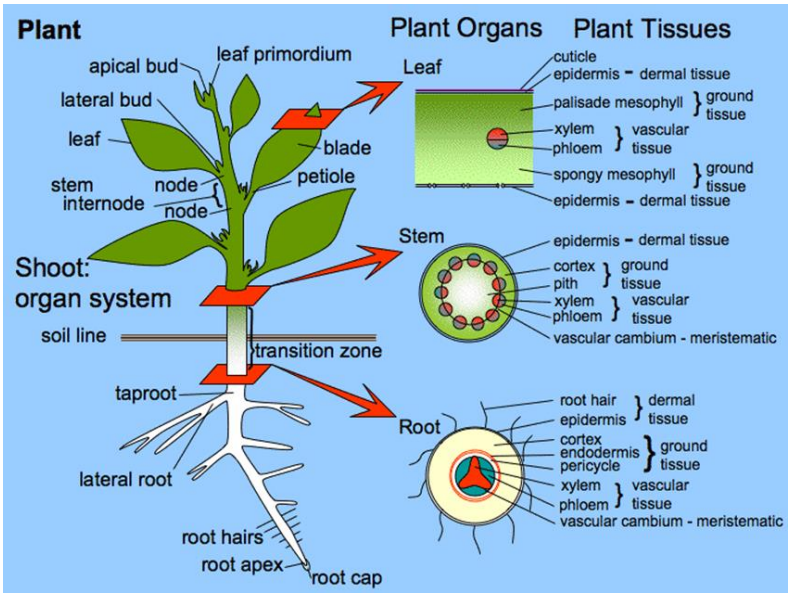
3. TEACHING THROUGH ICT

The practitioner used power point to teach tissue. Tissue is a group of cells that have similar structure and that function together as a unit. A non-living material, called the intercellular matrix, fills the spaces between the cells. This may be abundant in some tissues and minimal in others

4. DEVELOPING KNOWLEDGE ABOUT THE STRUCTURAL ORGANIZATION OF TISSUES

Meristems produce cells that quickly differentiate, or specialize, and become cells of permanent tissue; they differentiate into three main tissue types: dermal, vascular, and ground tissue. Each plant organ (roots, stems, leaves) contains all three tissue types:

1. Dermal tissue covers and protects the plant, and controls gas exchange and water absorption.



2. Vascular tissue transports water, minerals, and sugars to different parts of the plant. Vascular tissue is made of two specialized conducting tissues: xylem, which transports water and also provides structural support, and phloem, which transports sugars from sites of photosynthesis to other parts of the plant. The xylem and phloem always lie adjacent to each other in a vascular bundle.
3. Ground tissue carries out different functions based on the cell type and location in the plant, including photosynthesis, structural support for the stem and the vascular tissue, and storage for water and sugars.

4. TYPES OF PLANT TISSUES AND THEIR FUNCTIONS

Meristematic tissue:

These tissues have the capability to develop by swift division. They assist in the major growth of the vegetation. Growth in length and growth in diameter of the plant is carried about by these cells. The Meristematic cells are cubical, living

cells with a big nucleus. These cells are meticulously crammed with no intercellular spaces. Depending on the section where the meristematic tissues are existing, they are categorized as intercalary, lateral and apical meristems.

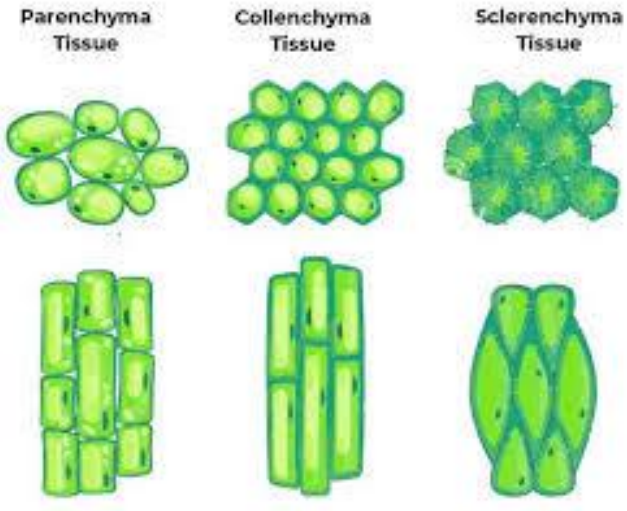
1. Apical meristem is existent at the growing tips or apical of stems and roots. Apical meristem upsurges the length of the plant.
2. Lateral meristem is existent in the radial portion of the stem or root. Lateral meristem upsurges the thickness of the plant.
3. Intercalary meristem is found at the internodes or at the base of the leaves. Intercalary meristem upsurges the size of the internode.

Old meristematic cells lose the capability to distribute and convert into permanent tissues. This procedure of capturing up a permanent function, size, and shape is termed as differentiation.

Permanent tissues:

These cells have lost their ability to distribute but are specialised to offer elasticity, flexibility and strength to the plant. These tissues can be additionally categorised into:

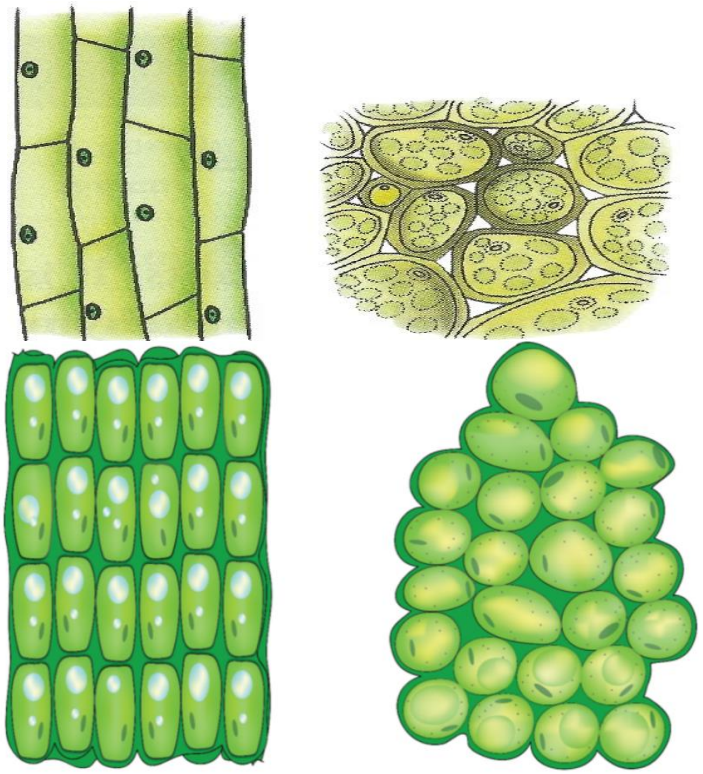
1. Simple Permanent Tissue: They can be classified into sclerenchyma, collenchyma and parenchyma based on their purpose.
2. Complex Permanent Tissue: These tissues include phloem and xylem. Xylem is valuable for the transportation of water and solvable constituents. It is made up of xylem parenchyma, fibres, vessels and tracheids. Phloem is valuable in the transportation of food particles. Phloem consists of phloem parenchyma, phloem fibres, companion cells, sieve cells and sieve tubes.



Parenchyma

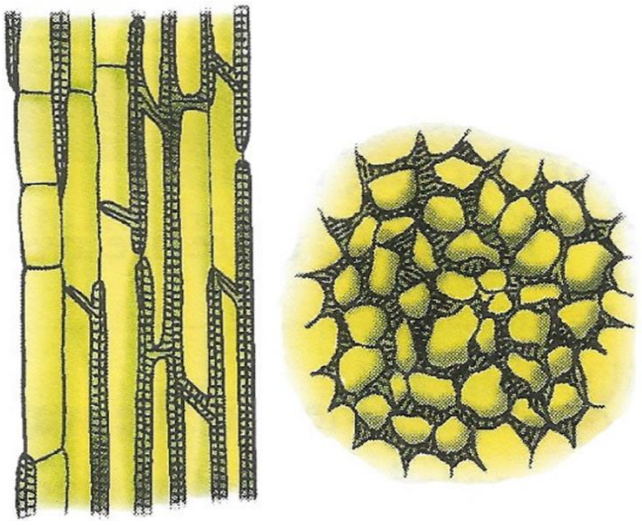
These are alive, polygonal cells with a big central vacuole, and have intercellular spaces amidst them. Parenchymatous cells create ground tissue and pith.

1. Parenchyma consisting of chloroplasts are termed as chlorenchyma. The chlorenchyma helps in photosynthesis.
2. Parenchyma which consists of big air voids is called aerenchyma. Buoyancy is the main purpose the aerenchyma.
3. Some parenchymatous cells perform as storage chambers for starch in vegetable and fruit



Longitudinal view

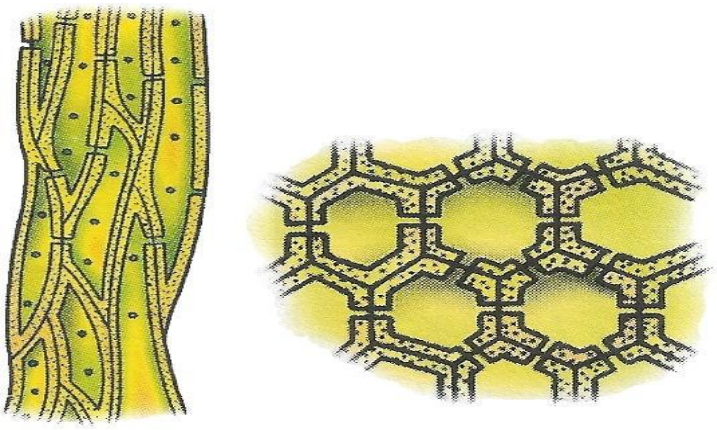
Cross-sectional view



Collenchyma

These are stretched out, living cells with minute intercellular gaps. Their cell walls are made up of pectin and cellulose. Collenchyma is found in the marginal regions of leaves and stems and offers flexibility with the structural framework and mechanical support to plants.

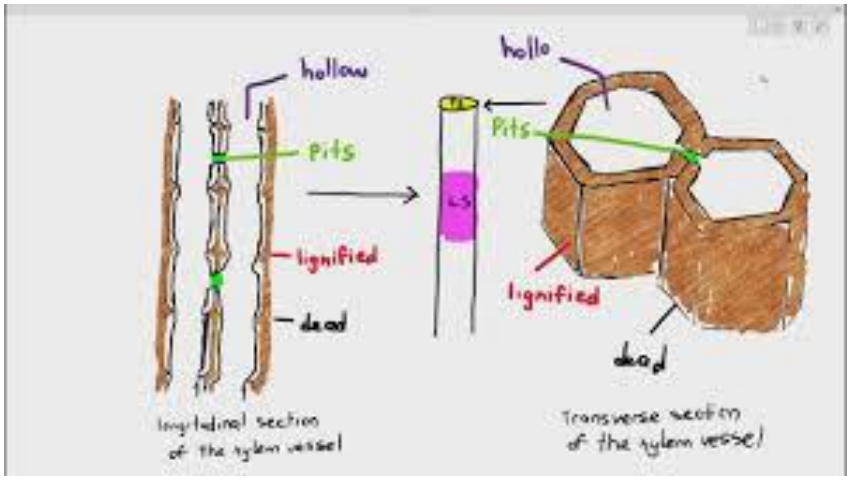
Sclerenchyma



These are elongated, dead cells with lignin deposits in their cell wall. They have no intercellular gaps. Sclerenchyma is found in the covering of seeds and nuts, around the vascular tissues in stems and the veins of leaves. Sclerenchyma provides strength to the plant.

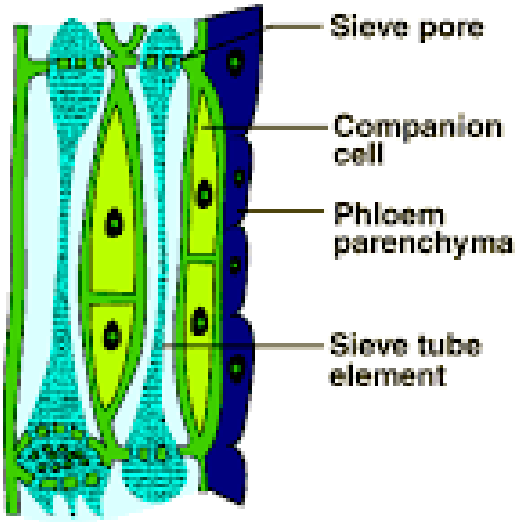
Xylem

It helps in the transport of dissolved substances and water all through the plant. The diverse components of the xylem include vessels, tracheids, xylem fibres and xylem parenchyma. Xylem fibres and Tracheids are made up of lignin, which provides structural support to the plant.

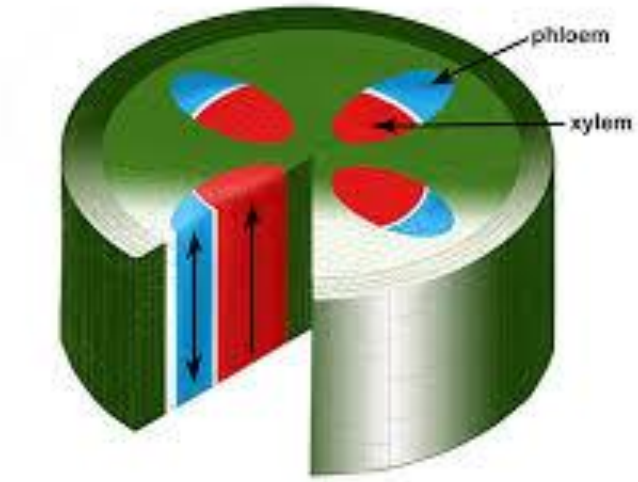


Phloem

This tissue helps in the transportation of food all through the plant. The diverse elements of phloem include phloem fibres, sieve tubes, phloem parenchyma and companion cells.



Phloem Tissue



5. HOW TISSUES ARE ORGANIZED TO FORM ORGANS

To identify how tissues are organized into specific patterns to form organs, follow these steps:

1. **Understand Tissue Types**: Learn about the four main types of tissues: epithelial, connective, muscle, and nervous tissues.
2. **Study Tissue Functions**: Understand the functions of each tissue type. For example, epithelial tissues cover body surfaces and line cavities, while connective tissues provide support and binding for organs.
3. **Learn about Germ Layers**: Recognize that all cells and tissues in the body derive from three germ layers during embryonic development: ectoderm, mesoderm, and endoderm. These layers give rise to different types of tissues that form organs.
4. **Explore Tissue Patterning**: Delve into the concept of tissue patterning, which relies on the specification of different cell types and tissues with

specialized features. This process involves cell growth, migration, and differentiation, leading to the formation of specific organ structures.

5. **Observe Histological Images**: Use histological images to visually identify different tissue types and their arrangement within organs. This can help in understanding how tissues are organized to fulfil specific organ functions.

By following these steps, you can gain insights into how tissues are organized in specific patterns to form organs, facilitating their identification and understanding.

6. HOW TISSUES ARE ORGANIZED TO FORM ORGANS

Plant tissues

Tissues are groups of cells which work together to carry out a specific function. A collection of tissues which work together to carry out a function is called an organ. Plants possess the following tissues:

Epidermal tissues – the epidermis is the upper tissue layer of a leaf. It is thin and transparent which allows light to reach the photosynthesising cells in the palisade mesophyll layer below. Together with the waxy cuticle, it also protects the leaf from damage.

Palisade mesophyll – this is a tissue layer found towards the top of leaves where most of the photosynthesis takes place. Cells in the palisade mesophyll layer are found close together and are packed full of chloroplasts to absorb the light energy needed for photosynthesis. Their position towards the top of the leaf also means that they can absorb as much light energy as possible.

Spongy mesophyll – this is a tissue layer in the leaves which contains air spaces to allow gas exchange to take place. The carbon dioxide needed for photosynthesis

can circulate and diffuse into cells while the oxygen produced from photosynthesis can diffuse out of the cells and into the air spaces and will eventually diffuse out of the leaf through the stomata.

View fullsize

leaf structure.jpg

Xylem and phloem – these are vessels which transport water and sugars around the plant. Xylem carries water (and dissolved mineral ions) from the roots to the rest of the plant. Phloem vessels transport sugars from photosynthetic regions of the plant (such as the leaves) to other parts of the plant.

Meristem tissue – this is found at the growing tips of roots and shoots and contains stem cells. Stem cells are unspecialised cells which can divide into any type of cell to form the various parts of a plant (for example, some stem cells will become root cells, others will become pollen grains). The meristems also contain cells which are actively dividing which allows the plant to grow

7. PROCESS, TYPES, AND SIGNIFICANCE OF CELL DIVISION

Cell division is a fundamental process in which a parent cell divides into two or more daughter cells. It plays a crucial role in growth, development, repair, and reproduction in organisms.

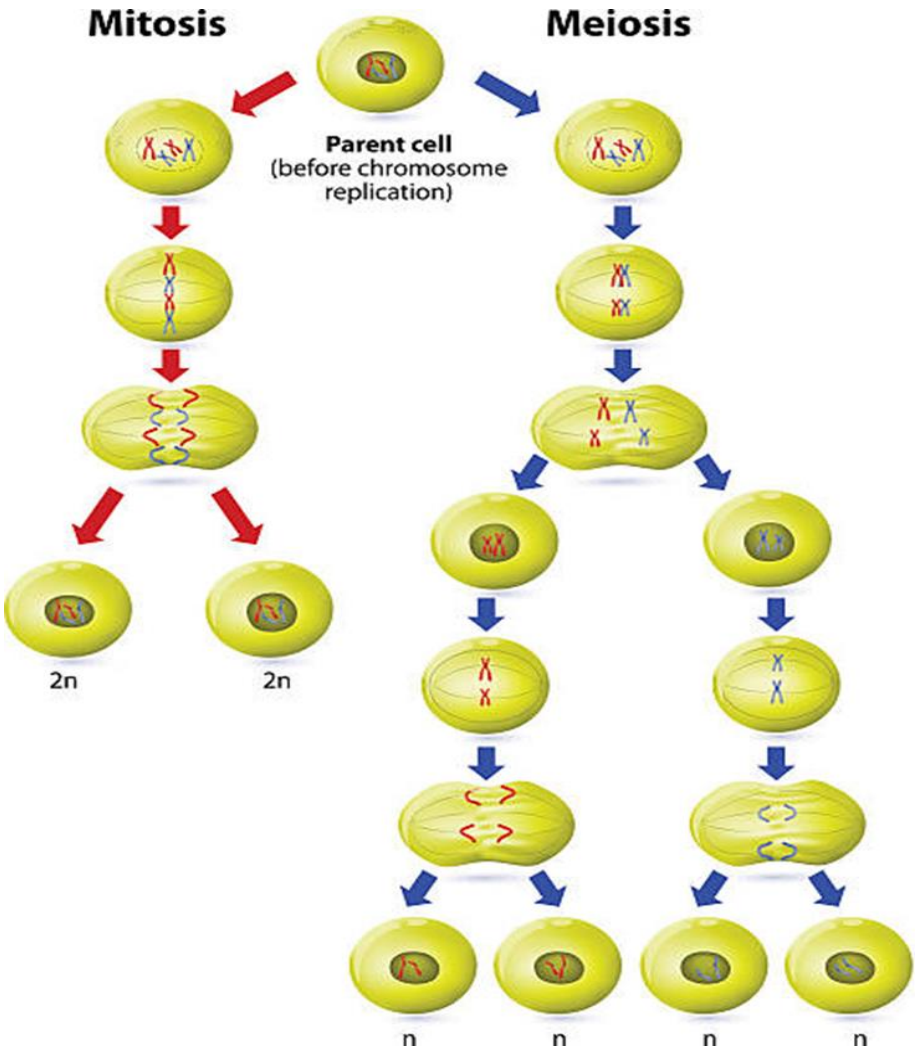
Process:

1. **Mitosis:** Mitosis is a type of cell division that results in two daughter cells with the same number of chromosomes as the parent cell. It occurs in somatic cells and is essential for growth, repair, and maintenance of multicellular organisms

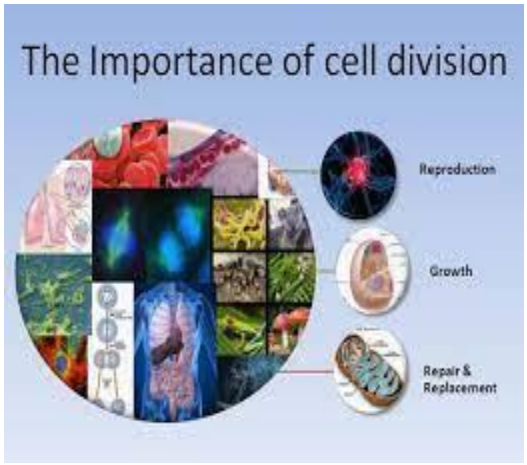
2. **Meiosis:** Meiosis is a specialized form of cell division that occurs in reproductive cells (germ cells) and leads to the production of gametes (sperm and egg cells). It involves two sequential divisions, resulting in four daughter cells with half the number of chromosomes as the parent cell

Significance:

1. **Growth and Development:** Cell division is vital for the growth and development of organisms. It allows for the increase in cell number, leading to tissue and organ formation.



2. **Tissue Repair:** After injury or damage, cell division facilitates tissue repair by replacing damaged or dead cells with new ones.
3. **Reproduction:** In sexually reproducing organisms, cell division is essential for the production of gametes, which are necessary for fertilization and the formation of new individuals.
4. **Genetic Diversity:** Meiosis generates genetic variation by shuffling genetic material during the formation of gametes, contributing to genetic diversity in offspring



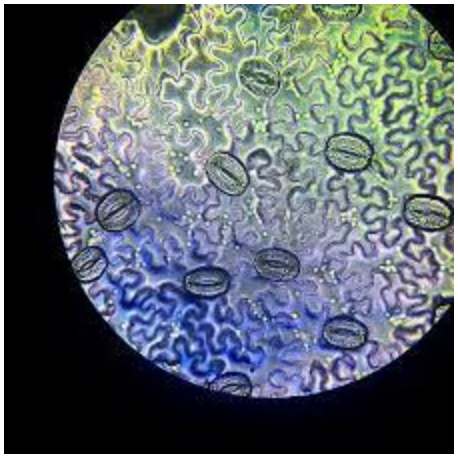
Understanding the process and types of cell division is crucial for comprehending various biological processes and their significance in living organisms.

8. TEACHING THE CONTENT USING MOBILE PHONE WITH QR CODES, EDUCATIONAL VIDEOS, ASSESSMENT

The practitioner has demonstrated by using the mobile phones and taught the content with QR codes, educational videos, assessment etc.,

9. DEMONSTRATION OF SIMPLE EXPERIMENTS TO TEACH PLANT TISSUE

Microscopy Observation: The practitioner simple experiments using prepared slides of plant tissues and allowed the students to observe under a microscope. Guided them to identify different types of plant tissues such as epidermis, parenchyma, collenchyma, and sclerenchyma



Leaf Structure Under the Microscope

Staining Techniques: The practitioner Introduced simple staining techniques like iodine staining to demonstrate the presence of starch in plant tissues. This hands-on experiment helps students understand the role of different tissues in storing nutrients

Cross-Section Preparation: The practitioner demonstrated how to prepare cross-sections of plant stems or roots using simple tools like razor blades and slides. This experiment helps students visualize the internal structure of plant tissues and understand their organization

Tissue Dissection: Perform a tissue dissection of plant leaves or stems to identify and isolate specific tissues. This activity allows students to explore the function and arrangement of different types of plant tissues in more detail. By conducting these simple experiments, students have gained a better understanding of plant tissue structure, function, and importance in plant biology.

The practitioner had resolved the learning difficulties by using ICT and demonstrating the simple science experiments and motivated all the students to learn the plant tissue, morphology, types and functions.

10.CLARIFICATION OF THE DOUBTS

The practitioner had clarified the doubts raised by the teachers in down loading the videos.

11.POST TEST

Post-test was conducted by using achievement test.

11. ANALYSIS AND INTERPRETATION OF THE DATA

1. DESCRIPTIVE STATISTICS

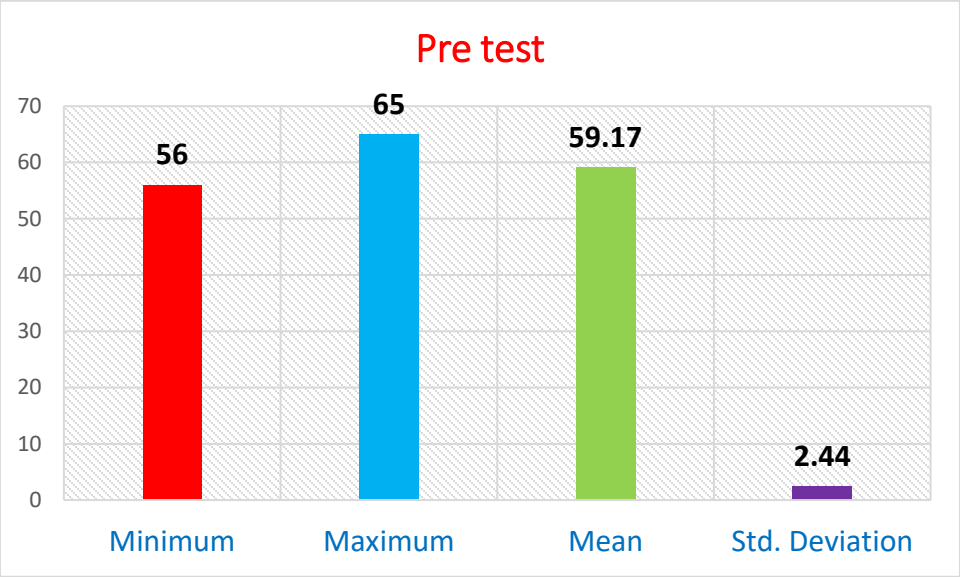
Table 1

Table showing the minimum, maximum, mean and standard deviation of the students in the organisation of plant tissue in the pre-test

Test	N	Minimum	Maximum	Mean	Std. Deviation
Pre-test	34	56.00	65.00	59.17	2.44

The above table showing the minimum, maximum mean and standard deviation of the students in the organisation of plant tissue in the pre-test.

Graph 1 showing the minimum, maximum mean and standard deviation of the students in the organisation of plant tissue in the pre-test.



- ❖ In the pre-test the minimum score is 28 and the Maximum is 58.
- ❖ The mean and standard deviation is 42.35 and 11.20 respectively.

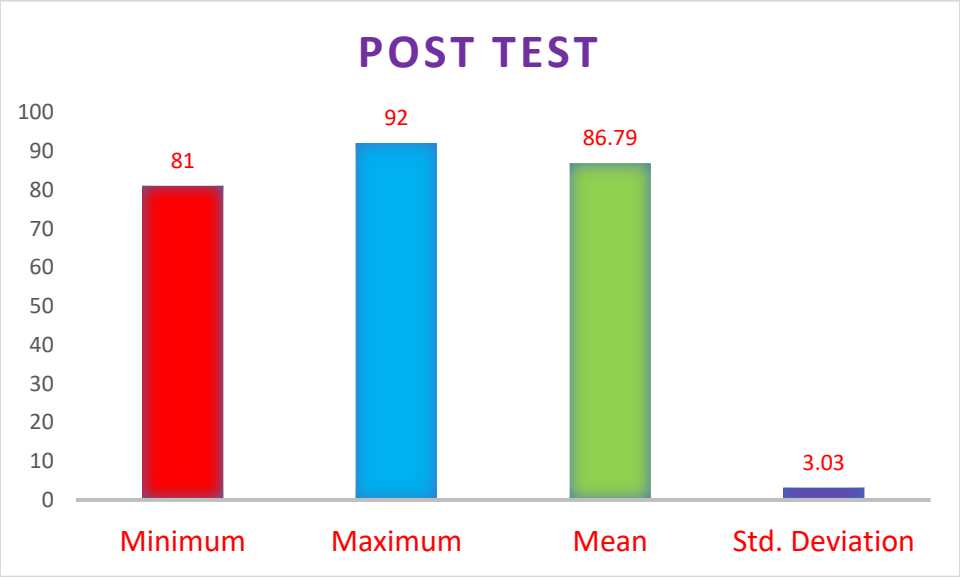
Table 2

Table showing the minimum, maximum mean and standard deviation of the students in the organisation of plant tissue in the post-test.

Post test

Test	N	Minimum	Maximum	Mean	Std. Deviation
Post test	34	81.00	92.00	86.79	3.03

Graph 2 showing the minimum, maximum mean and standard deviation of the students in the organisation of plant tissue in the pre-test.



- ❖ In the post-test the minimum score is 81 and the Maximum is 92.
- ❖ The mean and standard deviation is 59.79 and 3.03 respectively.

Table 3

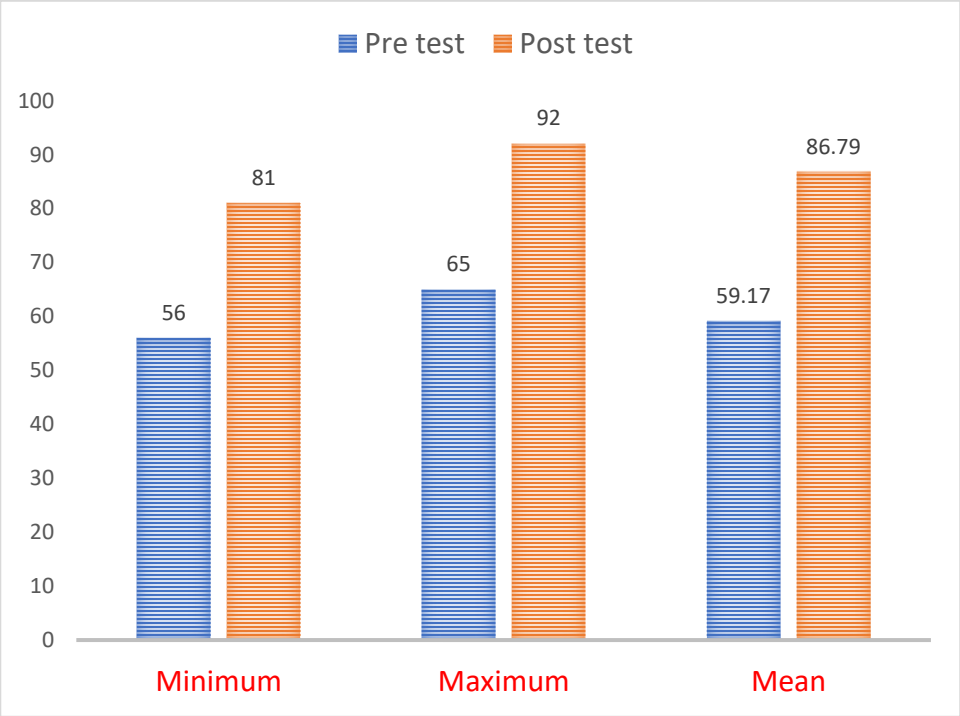
Minimum, maximum, mean and standard deviation between Pre-test and post-test of the students in the organisation of plant tissue

Test	N	Minimum	Maximum	Mean	Std. Deviation
Pre-test	34	56.00	65.00	59.17	2.44
Post test	34	81.00	92.00	86.79	3.03

- ❖ The minimum score in the pre-test (56) has increased to 81 in the post test
- ❖ The minimum score in the pre-test (65) has increased to 92 in the post test

- ❖ The mean value of the pre-test has increased from 59.17 to 86.79 to the post test with the standard deviation of 2.44 and 3.03 respectively.

Graph 3 showing the minimum, maximum mean and standard deviation of the students in the organisation of plant tissue between Pre and Post test



1. TESTING THE HYPOTHESIS OF THE STUDY

There is no significant difference between pre-test and post-test mean scores in the organisations of plant tissue among standard IX students**.**

Table 5

t test showing the significant difference between pre-test and post-test mean scores in the organisations of plant tissue among standard IX students

Test	N	Mean	SD	t value	P value	Result
Pre-test	**34**	**59.17**	**2.44**	**52.17**	**0.00**	**Sig**

Post test	**34**	**86.79**	**3.03**			

The above table 5 shows showing the significant difference between pre-test and post-test mean scores in the organisations of plant tissue among standard IX students

The calculated P value 0.00 is less than 0.01 and it is not significant at 0.01 level.

Hence the formulated hypothesis "There is no significant difference between pre-test and post-test mean scores in the organisations of plant tissue among standard IX students" is not accepted.

Inference: The pre-test mean score 59.17 has increased in the post test to 56.79 with the SD of 2.44 and 3.03.

Findings: There is no significant difference between pre-test and post-test mean scores in the organisations of plant tissue among standard IX students.

12. FINDINGS

1. In the pre-test, the minimum score is 28 and the Maximum is 58.
2. The pre-test means and standard deviation is 42.35 and 11.20 respectively**.**
3. In the post-test the minimum score is 81 and the Maximum is 92.
4. The mean and standard deviation is 59.79 and 3.03 respectively**.**
5. The minimum score in the pre-test (56) has increased to 81 in the post test
6. The minimum score in the pre-test (65) has increased to 92 in the post test
7. The mean value of the pre-test has increased from 59.17 to 86.79 to the post-test with the standard deviation of 2.44 and 3.03 respectively**.**

8. **OUT COME OF THE STUDY**

6. The IX standard students have understood the different types of tissues and their morphology.
7. The IX standard students have Identified how tissues are organized in specific patterns to form organs
8. The IX standard students have Understand how tissues perform life activities in plants.
9. The IX standard students have Gained knowledge about the structural organisation
10. The IX standard students have familiarized with the process, types and significance

9. **CONCLUSION**

The conclusion of the study highlights the successful alignment of classroom activities with the stated objectives. Through the implementation of these activities, students were able to achieve a deeper understanding of plant tissues and related concepts. The outcomes of the study indicate that: Students have gained knowledge about the various types of tissues and their morphology, enabling them to identify and differentiate between them effectively. They have developed an understanding of how tissues are organized in specific patterns to form organs, recognizing the structural complexities involved in plant anatomy. Students now comprehend how tissues perform vital life activities in plants, such as photosynthesis, nutrient transport, and growth regulation. They have acquired knowledge about the structural organization of tissues, including their cellular composition and arrangement within plant structures. Students are now familiar with the process, types, and significance of cell division in plant growth and

development, enhancing their grasp of plant physiology. Overall, the study demonstrates the effectiveness of tailored classroom activities in achieving the intended learning outcomes related to plant tissues and biology

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Annexure- Tool

மாவட்ட ஆசிரியர் கல்வி மற்றும் பயிற்சி நிறுவனம் .கிருஷ்ணகிரி

ஒன்பதாம் வகுப்பு -அறிவியல்

I.சரியான விடையைத் தேர்ந்தெடுத்து எழுதுக **1X10=10**

1.இவை தண்டு மற்றும் வேரின் பக்கவாட்டில் அதன் நீள அச்சுக்கு இணையாகக் காணப்படுகின்றன

A.நுனி ஆக்குத் திசு B.இடையாக்குத் திசு

C.பக்க ஆக்குத்திசு D.நுனி ஆக்குத் திசு மற்றும் இடையாக்குத் திசு

2.புளோயும் கூறுகளுடன் தொடர்பு இல்லாதது எது?

A.சல்லடைக்குழாய் B.துணைசெல்கள்

C.புளோயம் பாரன்கைமா D.டிரக்கீடுகள்

3.நார்கள்……..கொண்டுள்ளது

A.பாரன்கைமா B.ஸ்கிளிரன்கைமா

C.கோலன்கைமா D. ஏதும் இல்லை

4.கீழ்க்கண்ட எது ஒரு கூட்டுத் திசுவாகும்.

A.பாரன்கைமா B. கோலன்கைமா

C.சைலம் D. ஸ்கிளிரன்கைமா

5.ஏரேன்கைமா எதில் கண்டறியப்படுகிறது?

A.தொற்று தாவரம் B. நீர்வாழ் தாவரம்

C.சதுப்பு நில தாவரம் D. வறண்ட தாவரம்

6. ஒரு ஆக்குத்திசு கொண்டிருப்பது

A. பகுப்படையக் கூடிய மற்றும் நிலையில் உள்ள முதிர்ச்சியுள்ள செல்கள்

B. முதிர்ந்த செல்கள்

C. உயிரற்ற செல்கள்

D. ஸ்கிளிரன்கைமா செல்கள்

7. குளோரன்கைமா உருவாக்கம் _____ ல் அறியப்பட்டது.

A. குளோரோலோவின் சைட்டோபிளாசத்தில்

B. பச்சை பூஞ்சாணம் அஸ்பர்ஜில்லாவின் மைசிலியத்தில்

C. மாஸ்வுடைய ஸ்போர் கேம்சூலில்

D. பைனாஸின் மகரந்த குழாயில்

8.ஃபுளோயத்தின் கடத்தும் கூறுகள் சல்லடைக்குழாய் கூறுகள்

A. சல்லடைக்குழாய் கூறுகள்

B. துணை செல்கள்

C. ஃபுளோயம் பாரன்கைமா

D. ஃபுளோயம் நார்கள்

9.. துணை செல்கள் ____ வுடன் மிக நெருக்கமாக இணைந்துள்ளன.

A.சல்லடைக் கூறுகள் B.பாத்திரக் கூறுகள்

C.ட்ரைக்கோம்கள் D.துணை செல்கள்

10.உயிருள்ள மெல்லிய சுவருடைய பல கோண வடிவ செல்களைக் கொண்டுள்ள திசு.

A. பாரன்கைமா B.கோலன்கைமா

C.ஸ்கிளிரன்கைமா D.மேலே கூறிய எதுவும் இல்லை

II. கோடிட்ட இடத்தை நிரப்புக: **5X5=5**

11. உள்ளுறுப்புகளுக்கு _____திசுக்கள் உறுதியை அளிக்கின்றன.

12. பாரன்கைமா, குளோரன்கைமா, ஸ்கிளிரன்கைமா ஆகியவை_____வகையான திசு

13. _____ _____மற்றும் _____ஆகியவை கூட்டுத்திசுக்களாகும்.

14. _____திசுக்கள் ஒன்றுக்கு மேற்பட்ட வகை செல்களால் உருவானது மற்றும் இவைகள் ஒற்றிணைந்து ஒரு அலகாக வேலை செய்கிறது.

15. புற்கள் கணுவிடைப் பகுதியின் அடியில் _____ திசுக்கள் காணப்படுகின்றன.

III. சரியா தவறா எனக் கூறுக. **5X5=5**

16.புற்கள் கணுவிடைப் பகுதியின் அடியில் காணப்படுவது இடை ஆக்குத்திசு ஆகும்

17.ஸ்கிளீரன்கைமா திசு மீது ஒளிபடும்போது - பசுங்கணிகங்களை உற்பத்தி செய்து - குளோரன்கைமாவாக மாறும்.

18.ஸ்கிளீரன்கைமா முதிர்ந்த நிலையில் புரோட்டோபிளாசம் அற்று காணப்படுகிறது.

19.சைலம் டிரக்கீடுகள் நீண்ட அல்லது குழாய் போன்றவை.தடித்த மற்றும் 'லிக்னின்' சுவரைக் கொண்ட இறந்த செல்களாகும்.

20.சணல் -அறிவியல் பெயர் கன்னாபினஸ் சட்டைவா ஆகும்

IV.கீழ்கண்டவற்றை பொருத்துக **5X5=5**

21. ஸ்கிளிரைடுகள்- A.குளோரன்கைமா

22. பசுங்கணிகம் - B. ஸ்கிளிரன்கைமா

23. எளியதிசு - C. கோளன்கைமா

24. துணை செல் - D.சைலம்

25. டிரக்கீடுகள் - E. ஃபுளோயம்

PHOTOS