Part 1: Threshold Concept

Selected Threshold Concept: Traversal Order Affects Fault Detection in Circuits

What Students Know:

- Basic circuit symbols and their meanings
- Reading simple circuit diagrams
- Understanding that current flows from a source through components
- All components/nodes must be checked in a fault-finding exercise

What Students Don't Know:

- That the order of checking components can affect how quickly faults are found
- How different tracing approaches (level-wise vs. depth-wise) change the fault detection process
- How certain approaches can help detect repetitive loops (feedback paths) in circuits

Principles:

1. Traversal Order Affects Result
2. Cycle Detection Capability (feedback/loop detection)
3. Level-wise vs. Depth-wise Exploration

Part 2: Case Study

Case Study Title: *"The Faulty Amplifier Lab"*

Context:
In the Basic Electronics lab, a first-year B.Tech student team is troubleshooting a faulty amplifier circuit. The amplifier isn't working as expected, and the task is to locate the problem. The students split into two approaches to test the connections and components.

Scenario:
You're part of the troubleshooting team. Starting from the power supply, you observe how each student checks the circuit.

- **Student A** begins by checking all components directly connected to the power supply first, then moves on to the next "layer" of components (level-wise).
- **Student B** starts at the power supply, follows one connection deeply through several components, and only comes back to check other paths later (depth-wise).

You notice that the choice of method changes how quickly faults are found and whether certain feedback loops or repeated paths are detected early.

Your Task:
The lab instructor wants you to explain:

- Why the order in which the components are tested changes the fault detection process.
- Which approach helps identify *all* faults more systematically.
- Which approach is better at spotting feedback loops early.
- Which method works best when you need to find the closest fault to the power source quickly.

You're expected to simulate, observe, compare, and reflect on both approaches.

Case Study using Bloom's Taxonomy

- **Remember:** Recall the two tracing methods used.
- **Understand:** Explain the difference between level-wise and depth-wise tracing.
- **Apply:** Use the correct tracing method for finding a nearby fault.
- **Analyze:** Compare both methods for their efficiency in finding different types of faults.
- **Evaluate:** Decide which method is better for specific fault scenarios and justify.
- **Create:** Develop a hybrid tracing strategy for maximum efficiency.

Case Study using Fink's Taxonomy

- **Foundational Knowledge:** Learn the two tracing styles.
- **Application:** Trace a sample amplifier circuit using both methods.
- **Integration:** Connect this learning to other systems (e.g., water flow, traffic routing).
- **Human Dimension:** Reflect on personal problem-solving strategies in lab settings.
- **Caring:** Appreciate the importance of an efficient approach for lab safety and time-saving.
- **Learning How to Learn:** Build a personal decision rule for selecting a tracing method.

Case Study using SOLO Taxonomy

- **Pre-structural:** Observe tracing without understanding differences.
- **Uni-structural:** Identify one key difference between methods.
- **Multi-structural:** List several differences without linking them.
- **Relational:** Link tracing style to fault detection speed and accuracy.
- **Extended Abstract:** Apply the tracing decision-making to unrelated engineering troubleshooting.

Comparison Table

Aspect	Bloom's Taxonomy	Fink's Taxonomy	SOLO Taxonomy
Focus	Cognitive skill progression	Holistic learning (includes affective and integration)	Depth and complexity of understanding

Stages	Remember → Understand → Apply → Analyze → Evaluate → Create	Foundational → Application → Integration → Human Dimension → Caring → Learning How to Learn	Pre-structural → Uni-structural → Multi-structural → Relational → Extended Abstract
Strength	Clear hierarchy for cognitive outcomes	Encourages connection to real-world and personal growth	Measures sophistication of understanding
Use in this Case Study	Defines lab tasks at increasing cognitive levels	Adds relevance, self-awareness, and motivation	Shows progress from observation to conceptual transfer

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Part 3: Reflection Questions and Learning Outcomes

Reflection Questions (Bloom Level: Apply)

1. Which tracing method would you use to find a short circuit near the power source quickly, and why?
2. If the circuit contains a feedback loop, which method would detect it earlier, and how?
3. For checking the entire circuit without missing any component, which method is better and why?

Mapped Learning Outcomes:

- Students will be able to apply and compare circuit tracing strategies for fault detection.
- Students will identify which tracing approach detects feedback loops more effectively.
- Students will justify the selection of a tracing method for specific electronics lab fault scenarios.