# Program Information

## Lesson:

### *Employability Skills: Critical Thinking*

## Training:

## Fiber Optic

## Time frame:

### 60 minutes

# Instruction Section

## Learning Objectives:

# Identify and articulate key critical thinking skills necessary for premises cabling technicians, including analyzing, reasoning, problem-solving, planning, organizing, and decision-making.

# Collaboratively analyze a real-life case study to identify problems and propose solutions using critical thinking skills, demonstrating their ability to apply these skills in a practical context.

## Assessment Tools/Methods:

# Evaluate participants’ engagement in discussions and group activities.

# Assess the practicality and thoroughness of the solutions presented during group presentations.

# Provide feedback on the application of critical thinking skills in the scenarios discussed.

## Learner Prior Knowledge:

# Basic Understanding of Fiber Optic Cabling: Understanding of how fiber optic systems transmit signals (light pulses) and familiarity with terms such as ONT, OSP, connectors, splices, and loss.

# General Technical Knowledge: Basic technical knowledge related to network infrastructure, such as understanding network topologies, common networking terms, and basic troubleshooting steps.

# Workplace Safety: Awareness of workplace safety standards and basic safety precautions when handling fiber optic cables (e.g., avoiding fiber shards).

## Instructional Activities:

# Begin by briefly discussing the importance of critical thinking in the role of a fiber optic technician.

# Conduct a quick icebreaker where participants discuss what they feel that critical thinking means in the context of troubleshooting fiber optic issues.

# Activity 1: Critical Thinking Framework

# With the whole group, introduce the Critical Thinking Framework using the points below:

# Analyze: Identify the problem.

# Reason: Gather and evaluate information.

# Solve: Develop a solution.

# Plan: Organize steps for execution.

# Decide: Implement the best solution.

# Ask the group to discuss problems they expect to encounter as fiber optic technicians.

# Read the scenario on the Applying Critical Thinking in Fiber Optics Handout to the group.

# Scenario: A small business reports slow internet speeds at their office, which relies on a fiber optic network. Their internet service provider conducted an initial test and determined there’s a signal loss issue but could not identify the cause. You are part of the technician team sent to troubleshoot.

# Divide the participants into small groups and ask them to work through the Critical Thinking Framework for the scenario handout.

# After a few minutes, bring the groups together to discuss their responses.

# Activity 2: Problem Solving

# Divide the participants into small groups and distribute the Troubleshooting Fiber Optic Networks Handout.

# Point out the diagram descriptions and the test reading information on the handout.

# Allow the groups time to identify the issue, brainstorm solutions, and outline an action plan using the Critical Thinking Framework.

# Circulate between the groups to prompt a deeper analysis and reasoning of the scenarios; ask questions such as, “Why do you think this is happening?”

# Allow the groups time to share their analysis and solution.

# Instructor Answers to Handout:

# Question #1: Use an OTDR to pinpoint faults. Inspect connections and splices visually.

# Question #2: Dirty connectors, poor splices, or physical damage could cause the issues.

# Question #3: Clean all connectors, re-splice if needed, and retest to confirm resolution.

# Activity 3: Problem Solving Reflection and Wrap-Up

# Begin by asking reflective questions to deepen learning and encourage participants to think critically about the activity:

# “ What was the most challenging part of analyzing the scenario?”

# “How did your group prioritize information when reasoning through the data?”

# “ What would you do differently in future troubleshooting situations?”

# “How does the critical thinking framework help you as a fiber optic technician?”

# Ask the participants to share a real-life experience where they used or could have used the Critical Thinking Framework.

# Encourage participants to reflect on what they have learned and how they can apply these skills in their future work. To conclude the lesson, have each participant share the one critical thinking skill they found most valuable during the problem-solving activities and how they envision applying it in future cabling projects.

##  Resources:

# Whiteboard and markers

# Applying Critical Thinking in Fiber Optics Handout

# Applying Critical Thinking in Fiber Optic Instructor Sample Answers

# Troubleshooting Fiber Optic Networks Handout (note: sample answers are included in lesson plan)

# Reflection Section

What was the most helpful step in the critical thinking process for solving the scenario, and why? What challenges did you face when reasoning through the information, and how did you overcome them? How will you apply the critical thinking framework in your future work as a fiber optic technician?

*Note: AI, specifically ChatGPT 3.5, was used to generate scenarios for this contextualized lesson plan.*

**Applying Critical Thinking in Fiber Optics Handout**

**Scenario:**

A small business reports slow internet speeds at their office, which relies on a fiber optic network. Their internet service provider conducted an initial test and determined there’s a signal loss issue but could not identify the cause. You are part of the technician team sent to troubleshoot.

**Data Provided:**

1. **Network Details:**
	* Office connected to a central hub 200 meters away using singlemode fiber.
	* ONT located at the office shows weak signal strength (-25 dB, expected -15 dB).
2. **Initial Testing Results:**
	* Power meter reading at the patch panel: -22 dB.
	* OTDR trace shows a reflection event 150 meters from the office.
3. **Equipment Available:**
	* OTDR, power meter, cleaning tools, splicing kit.

**Task: Use the Critical Thinking Framework to answer the questions below.**

1. **Analyze:** Identify the problem based on the data provided.
	* *Question:* What appears to be the root cause of the weak signal strength?

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1. **Reason:** Gather and evaluate additional information.
	* *Question:* What further tests or inspections should you perform?

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1. **Solve:** Develop a solution to fix the issue.
	* *Question:* What specific actions would you take to resolve the problem?

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1. **Plan:** Organize the steps to implement your solution.
	* *Question:* List the steps you will follow to complete the repair and verify the fix.

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1. **Decide:** Make a final decision on the best course of action.
	* *Question:* What will you do to confirm the problem is resolved?

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**Applying Critical Thinking in Fiber Optics Instructor Sample Answers**

**Sample Answers for Instructor Use**

1. **Analyze:**
	* The root cause is likely a faulty splice or damage at the location of the reflection (150 meters from the office).
2. **Reason:**
	* Perform a visual inspection at 150 meters to check for visible damage or contamination.
	* Reconfirm the loss using the OTDR and power meter.
3. **Solve:**
	* If damage or a bad splice is found, clean the connectors or re-splice the fibers.
4. **Plan:**
	* Steps:
		1. Locate the fault at 150 meters.
		2. Clean or repair the splice.
		3. Use the splicing kit to fix any fiber breaks.
		4. Test with OTDR and power meter to confirm the repair.
5. **Decide:**
	* Perform final tests to ensure the signal strength at the ONT is restored to acceptable levels (-15 dB).

Troubleshooting Fiber Optic Networks Handout

**Scenario 1: Intermittent Internet Disruptions**

* **Diagram:** Basic home fiber network showing connections from the Optical Network Terminal (ONT) to the router.
* **Test Readings:**
	+ Loss measured at ONT: -15 dB (acceptable).
	+ Loss measured at the patch panel: -20 dB (too high).

**Scenario 2: Excessive Loss in a Newly Installed Link**

* **Diagram:** Outside Plant (OSP) network with splicing points labeled.
* **Test Readings:**
	+ OTDR Trace: Indicates a high reflection at one splice point.
	+ Power Meter Reading: -18 dB (expected -12 dB).

**Guiding Questions:**

1. *What additional tests or inspections should you perform?*

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1. *What are potential causes of these issues?*

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1. *What steps will you take to resolve the issue?*

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