# Technical Communication

## Essential Skills for CS Success

### College-Wide Learning Outcome

*The ability to engage effectively in verbal, non-verbal, written, and/or symbolic expression*

# Learning Objectives

## By the end of this session, you will understand:

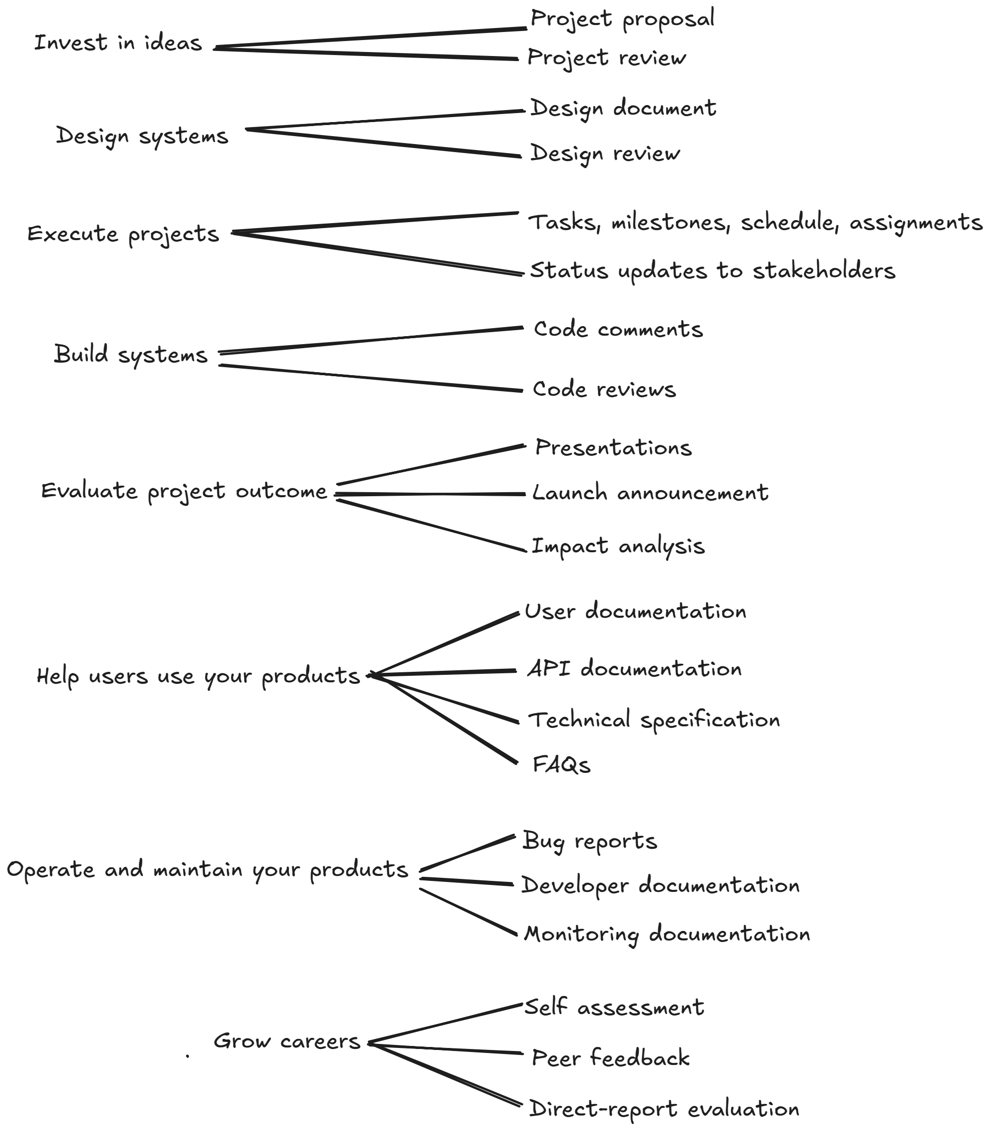
1. **Communicate** purpose, theme, or central message
2. **Account** for audience and context
3. **Follow** disciplinary conventions
4. **Utilize** supporting materials/sources and evidence

## Why Communication Matters in CS

> Clear communication $\iff$ Clear thinking

**If you can't explain it simply, you don't understand it well enough**

# Communication Scenarios in CS Careers



- Invest in ideas
  - Project proposal
  - Project review
- Design systems
  - Design document
  - Design review
- Execute projects
  - Tasks, milestones, schedule, assignments
  - Status updates to stakeholders
- Build systems
  - Code comments
  - Code reviews
- Evaluate project outcome
  - Presentations
  - Launch announcement
  - Impact analysis
- Help users use your products
  - User documentation
  - API documentation
  - Technical specification
  - FAQs
- Operate and maintain your products
  - Bug reports
  - Developer documentation
  - Monitoring documentation
- Grow careers
  - Self assessment
  - Peer feedback
  - Direct-report evaluation

# 🤔 Reflection Activity (2 min)

## Think-Pair-Share:

1. **Think**: One time poor communication caused a problem in your CS work
2. **Pair**: Share with your neighbor
3. **Share**: Volunteer examples for the class

*What could have been done differently?*

# Objective 1

## Communicate Purpose, Theme, or Central Message

# The What-Why-How Framework

| Element | Purpose | Key Question |
|---|---|---|
| **WHAT** | State what you built/solved | "What is it?" |
| **WHY** | Explain why it matters | "Why should I care?" |
| **HOW** | Brief technical approach | "How does it work?" |

# Example: Elevator Pitch

❌
## Bad Example

*"So, um, my project uses React and Node.js with MongoDB. I implemented JWT authentication and used Redux for state management. There's also a REST API with 15 endpoints..."*

✅
## Good Example

*"I built an app that helps college students save 30% on textbooks by connecting them directly for exchanges. Think of it as 'Uber for textbook sharing.' In our pilot, we saved students $15,000."*

# Quick Examples: Clear Purpose

| Context | Bad | Good |
|---|---|---|
| **Code Comment** | `// Processes data` | `// Prepares data for statistical analysis` |
| **Commit Message** | `Fixed stuff` | `Fix: DB connection leak (Bug #1648)` |
| **Email Subject** | `Update` | `URGENT: DB connection leak – Action required` |
| **Bug Report** | `Button problem` | `[CRITICAL] Payment button fails silently` |

🎯

# Practice: Elevator Pitch (5 min)

**Your turn! Create a 30-second pitch:**

1. Pick your current/recent project
2. Apply What-Why-How:
   - **WHAT**: One sentence description
   - **WHY**: Problem solved + impact
   - **HOW**: Key technical approach
3. Practice with a partner

# Objective 2

## Account for Audience and Context

**One size does NOT fit all**

# Tailoring to Your Audience

## Consider:

- **Technical level**: How much do they know?
- **Primary concerns**: What keeps them up at night?
- **Preferred format**: Email? Slack? Document?
- **Time available**: 30 seconds or 30 minutes?
- **Cultural context**: Formal? Casual? Direct?

# Scenario: Security Breach

## Same Information, Different Audiences

You discovered a SQL injection vulnerability that exposed customer data.

How do you communicate this to:

1. Fellow engineers?
2. Your manager?
3. Customer service team?
4. The public?

# Audience 1: Fellow Engineers

**Context**: Slack #engineering

**Tone**: Technical, solution-focused

```
@channel SECURITY ALERT - SQL Injection in User Login

**Vulnerability Details:**
- Location: AuthController.java line 142
- Issue: Raw string concatenation in SQL query
- Attack vector: username = "admin' OR '1'='1' --"
- Fix: Parameterized queries deployed to prod
```

# Audience 2: Your Manager

**Context**: Email

**Tone**: Impact-focused, professional

```
Subject: Security Incident Report - Resolved

Executive Summary:
We identified and patched a critical security vulnerability
that potentially exposed customer credentials.

Business Impact:
- Affected users: ~50,000
- Downtime for fix: 0 minutes
- Compliance: GDPR notification required

Next Steps: Legal review, customer communication...
```

# Audience 3: Customer Service

**Context**: Team guide

**Tone**: Clear, supportive

```
# Customer Support Guide

## If customer asks "Was my account hacked?"
"We found and fixed a security vulnerability before
any misuse was detected. As a precaution, we're asking
some customers to reset passwords. Payment info was
NOT affected."

## Escalation Path:
- Angry customers → Team Lead
- Technical questions → security@company
```

# Audience 4: The Public

**Context**: Social media

**Tone**: Transparent, brief

```
We recently discovered and fixed a security issue
affecting some user accounts. No payment info
was compromised.

What we're doing:
✅
 Issue fixed immediately
✅
 Affected users being notified
✅
 Password resets as precaution

More: [link]
```

🎭

# Activity: Audience Adaptation (8 min)

**Scenario: Your AI chatbot gave bad medical advice**

**Write 3 versions** (2 sentences each):

1. **Technical team** (debug the issue)
2. **Hospital admin** (your client)
3. **News reporter** (interview response)

**Share**: Read one version, class guesses the audience

# Objective 3

## Follow Disciplinary Conventions

### When in Rome… code as the Romans code

# CS Writing Conventions

## Key Areas:

- **Style Guides**: Google, organization-specific
- **Documentation**: Javadoc, JSDoc, docstrings
- **Papers**: IEEE/ACM format
- **Code**: Naming conventions, formatting
- **Version Control**: Commit message formats

# Example: Javadoc Convention

```
/**
 * Calculates the final customer price including tax.
 *
 * PURPOSE: Ensure consistent pricing across channels
 *
 * @param basePrice Original price before adjustments
 * @return Final price with 15% tax minus 13% discount
 * @throws IllegalArgumentException if price negative
 *
 * Example:
 *   calculatePrice(100.00) returns 130.50
 */
public double calculatePrice(double basePrice) {
    // Implementation...
}
```

# Research Paper Structure (IEEE/ACM)

## Standard Sections:

1. Abstract (150-250 words)
2. Introduction
3. Related Work
4. Methodology/Design
5. Implementation
6. Evaluation/Results
7. Discussion
8. Conclusion
9. References

## Abstract Formula:

- Problem (1-2 sentences)
- Gap/Challenge (1 sentence)
- Your approach (2-3 sentences)
- Results/Impact (1-2 sentences)

# RFC (Request for Comments) Style

```
1. Introduction
   1.1. Problem Statement
   1.2. Scope

2. Requirements
   2.1. MUST have
   2.2. SHOULD have
   2.3. MAY have

3. Proposed Solution
   3.1. Architecture
   3.2. Implementation Details

4. Security Considerations
5. References
```

*Example: IETF RFCs for Internet standards*

# Objective 4

## Utilize Supporting Materials & Evidence

### Show, don't just tell

# Citations in CS

## IEEE Citation Style (Most Common)

**In-text**: Use bracketed numbers [1], [2], [3]

**Reference list**:

```
[1] A. Smith and B. Jones, "Fast consensus in
    distributed systems," in Proc. ICDCS,
    Las Vegas, NV, USA, Jun. 2023, pp. 234–245.

[2] GitHub, "TensorFlow," 2023. [Online]. Available:
    https://github.com/tensorflow/tensorflow.
    [Accessed: Oct. 15, 2023].
```

# Data Visualization: Choose Wisely

| Data Type | ✅ Good Choice | ❌ Bad Choice |
|---|---|---|
| **Performance over time** | Line graph | Pie chart |
| **Parts of whole** | Stacked bar | 3D pie |
| **Correlation** | Scatter plot | Bar chart |
| **Distribution** | Histogram | Pie chart |
| **Comparison** | Bar chart | Area chart |

*Remember: Every pixel should convey information*

# Example: Algorithm Performance

## ❌ Bad: Pie Chart

```
Algorithm Speed:
- Bubble Sort: 35%
- Quick Sort: 15%
- Merge Sort: 20%
```

*Percentages of what? No context!*

## ✅ Good: Line Graph

```
Time (ms) vs Input Size (log scale)
Shows O(n²) vs O(n log n) clearly
Actual measurements with units
```

# Quantitative Evidence

### ❌ Vague

*"This technology made the website faster"*

### ✅ Specific

*"This technology reduced the 99th percentile page load time by **75%** (from 1200ms to 300ms), improving user retention by **18%**"*

**Always include**:

- Specific metrics
- Before/after comparison
- Impact on business/users

📊

# Activity: Evidence Makeover (5 min)

**Transform these vague statements:**

1. "Our app is popular"
2. "The algorithm is efficient"
3. "Users like the new feature"

**Make them specific with:**

- Numbers/percentages
- Time frames
- Comparisons
- User impact

# Putting It All Together

## The Communication Checklist:

- [ ] **Purpose clear** in first 10 seconds?
- [ ] **Audience appropriate** language/detail?
- [ ] **Conventions followed** for the format?
- [ ] **Evidence supports** all claims?
- [ ] **Action items** clear (if needed)?

*Use for every email, document, presentation*

# 📚 Recommended Resources

## Books:

- **"Write for your Life"** - Wheelan
- **"The Elements of Style"** - Strunk & White
- **"The Sense of Style"** - Pinker

## Online:

- Google Style Guides
- IEEE Author Center
- Writing for Computer Science (Zobel)
- Purdue OWL

# Key Takeaways

1. **Clear communication = Clear thinking**
2. **What-Why-How** structures your message
3. **Know your audience** and adapt accordingly
4. **Follow conventions** of your field
5. **Support with evidence**, not opinions

*These skills differentiate good engineers from great ones*