The Essential Steps of Developing a Training Course

Clean Energy Workforce Education Conference

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Course Design and Development

Goals of the Session

- Participants will create some components of a new module or course or improve an existing one using instructional design methods and strategies.

- Develop a positive attitude toward using instructional design
If you were going to design a course..........

What would you do first?

☐ Plan the content for the course?
☐ Figure out who the students are?
☐ Determine what the job requires?
☐ Pick the available media?
☐ Other?
Instructional Systems Design

- the **systematic** design, development, implementation, and evaluation
- of instructional materials, lessons, courses, or curricula
- in order to improve student learning and teaching efficiency (Gentry, 1989)
The **System** in ISD

- a system is ....
  - a set of related and interdependent components
  - working together to perform some function
The ADDIE Model: An Instructional System

*-- establishes the model as a system
ADDIE: Analyze

-- the process of determining the needs and the goals for the instruction
ADDIE: Design

-- the process of determining the objectives and criterion tests to meet the instructional goals.
ADDIE: Develop

-- the process of constructing and producing the instruction based on the design process.
ADDIE: Implement

-- the process of using the instruction in the setting for which it was planned
ADDIE: Evaluate

Feedback

-- the process of assessing the worth of the instruction as it is being developed (formative evaluation) and after it has been implemented (summative evaluation)
Let’s make this interactive!

Grab a Pencil

Put on your thinking cap

Pick a topic
ADDIE: Analyze

- Analyze
- Design
- Develop
- Implement
- Evaluate

Feedback

- Assess Needs
- Analyze Learners
- Analyze Setting
Is education or training needed?

- The Case of Lucy and Ethel
Training vs. Non-training Solutions

- What problems or opportunities **can** be solved by training?
  - Knowledge, skills, and attitude

- What problems or opportunities **cannot** be solved by training?
  - Equipment, lack of resources (people, $$), policies and procedures
Course Goal

☐ A **course goal** describes what the learners will be able to do at the end of a course.

☐ For example: Participants will include PV solutions in their emergency management plans.
Course Goal

☐ Here’s a template for a course goal:

Students in my course will [your statement here] when the course is over........
Some specific questions asked during a Learner Analysis:

- What *subject matter expertise and previous experience* do the learners have?
- Do they have any *major misconceptions* about the subject matter?
- What are the learner’s *attitudes*?
- Do learner’s have any *special needs or constraints*?
Learner Analysis

- What could you do to help all students learn if you have students in your course who have:
  - Varied backgrounds in the topic you are teaching?
  - Varied backgrounds in reading and math skills
Some key questions to ask:

- **Where** will the instruction be delivered?
- What kind of **facilities and equipment** will be available?
- Is **lab space** available? Sufficient equipment?
- **How many** students will there be?
- Will the course be offered to **groups**? **How often**?
- **Who will implement** the instruction?
Environment and Setting

What kind of **facilities and equipment** are most important for an effective class?

- Instructional?
- Content related?
Summary: Analyze

- Analyze
- Design
- Develop
- Implement
- Evaluate

Feedback

- Assess Needs
- Analyze Learners
- Analyze Setting
ADDIE: Design

- Analyze
- Design
- Develop
- Implement
- Evaluate

Feedback

- Develop Task Analysis
- Write Learning Objectives
- Develop Criterion Tests
Task Analysis:
the process of
breaking a main
task down into
subordinate tasks
NABCEP Task Analyses

- Solar Photovoltaic System Installer
- PV Entry Level Program
- Solar Water and Pool Heating Systems
- Solar Thermal Entry
- Small Wind Energy System Installer
- PV Technical Sales
Task Analysis Example

- Install PV system
  - Configure Electrical system
    - Determine wire sizing
  - Configure mechanical system
    - Select inverter
    - Select roof mount
## Rating the Importance of Tasks

<table>
<thead>
<tr>
<th>Consequence of Error</th>
<th>Chance of Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>Low</td>
</tr>
<tr>
<td>High</td>
<td>High</td>
</tr>
</tbody>
</table>

- **Should be taught**
- **Must be taught**
- **Could be taught**
- **Should be taught**
Learning objectives define in clear terms what the learner will be able to do after the instruction is over.

What does clear mean?
- **observable** and **measurable**

Explain after the instruction is over?
- **after the training** and **back on the job**
Learning objectives – they are as easy to write as A, B, C, D

**Audience:** who is performing the task

**Behavior:** what the task or skill is

**Conditions:** given what resources and/or constraints

**Degree:** to what standard or criterion; how well or how often
Examples of Objectives

- Notice that objectives are written **CABD**
  - Given an PV array, each learner will install it on the building according to the criteria specified in the checklist.
  - Given the specs for a PV installation, each learner will specify how the array will be installed by answering 8 of 9 questions.

- **Conditions:** Define whether or not you can recreate what the learner will do in the real world when testing in the classroom
Criterion-referenced testing (CRT): the process of writing evaluation items and/or performance checklists to test students’ mastery of the learning objectives.
Ways to Evaluate Learners

- Test Items
- Performances
- Products or work samples
Types of Test Items

Two Primary Types:

- **Selected-response:** Multiple choice, True/False, Matching

- **Constructed-response:** Fill-in-the Blank, Short Answer, Essay
Write Test Items that Transfer

- Situation-based or problem-based stems require *application* of ideas and make very good test items.
- Use graphics, charts, illustrations, pictures, scenarios, examples, dicey problems, case studies, etc.
Checklists

Use a checklist anytime you have to evaluate **multiple** components of a behavior: **Install a solar system**
Criterion-referenced Checklists

☐ Product
☐ Performance

Which one is Product? Performance?
☐ installing the small wind system?
☐ the wind system after it is installed?
Practice Activity: Objectives and Tests/Checklists

- Write a learning objective
- Describe a corresponding test item or checklist

Remember: ABCD
ADDIE: Design

- Analyze
- Design
- Develop
- Implement
- Evaluate

Feedback

Develop Task Analysis
Write Objectives
Develop Criterion Tests
The KEYS to the **Design** phase

- Specify what the students will have to do on the job!
- Test job-related skills, not the recall of facts
ADDIE: Develop

-- the process of producing the instruction based on the design process.
Pratize Nakes Purfect
Practie Make Perfffect
Practice Makes Perfect
ADDIE: Develop

- Design a lesson
- Select the Media
- Plan the “message”
The Way People Learn

- Attend
- Organize
- Code
- Store
- Retrieve
## Lesson Design

<table>
<thead>
<tr>
<th>Element</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Introduce the topic</td>
<td>Attend/Organize</td>
</tr>
<tr>
<td>2. Present the objective</td>
<td></td>
</tr>
<tr>
<td>3. Present the material</td>
<td>Organize/Code (your strategy)</td>
</tr>
<tr>
<td>4. Show correct performance</td>
<td></td>
</tr>
<tr>
<td>5. Provide practice</td>
<td>Organize/Code/Store (their strategy)</td>
</tr>
<tr>
<td>6. Give feedback</td>
<td></td>
</tr>
<tr>
<td>7. Assess their performance</td>
<td>Retrieve</td>
</tr>
<tr>
<td>8. Provide review and summaries</td>
<td></td>
</tr>
</tbody>
</table>
Use an Advance Organizer: Grid-Connected Systems

- Energy source
- Installing and Wiring the Array
- Utility Interactive Inverter
- Connecting to the Grid
- Energy storage
- Electric utility
- Energy use
Media Selection

- Two Major Principles:
  - There is no one best media for the task: a lot of different media will work.
  - It is always easier to adapt and modify than create from scratch. Use the CASE Method and R & D
Media vs. Message

The *instructional strategy* incorporated into the media is more important than the media itself.

Can the media provide:

* practice
* feedback
* reinforcement
* demonstrations
* cues
* examples
The Show Must Go On!
Summarize and review

- have summaries at the end of each section and each session
- start each session with a review
- ask questions
- students love a review!
Talk to the audience, not the media

They might remember the back of your head!
Move out of the way of the screen so everyone can see.
**Showmanship**

**Motivation**

**Turn the projector off when:**
- you are not using it
- you are changing transparencies/slides
- there is nothing on the screen

(a bright white screen will draw learners’ attention to it)
Paraphrase the message; don’t read it to the audience

- use complementary messages
- uses dual channels (senses)
The ARCS Motivational-Design Model: John Keller

- Get students’ attention
- Make it relevant
- Build confidence in their success
- Reinforce their success
ADDIE: Evaluate

Analyze  Design  Develop  Implement  Evaluate

Feedback

Levels of Evaluation  Formative Evaluation  Summative Evaluation
Levels of Evaluation

Formative Evaluation

Summative Evaluation

Four Levels of Evaluation (Kirkpatrick)

1: Reactions
2: Objectives
3: Transfer
4: Payoff
Formative Evaluation: the process of improving the instruction *BEFORE* it is implemented

3 activities to complete
- self-appraisal
- expert review
- prototype test

*Kirkpatrick: Levels 1 & 2*
After Formative Evaluation, the instruction is ready to....

Implement!

The Show Must Go On!
Summative Evaluation: the process of assessing the instruction after it has been implemented

- Check off all four of Kirkpatrick’s Levels
  - #1 How did the learner react to the instruction?
  - #2 Did learners meet the objectives?
  - #3 Can learners transfer the learning?
  - #4 Was the institutional need met?
#3 Can learners **transfer** the knowledge and skills?

- Can the learner perform on the job?
  - ☐ If not, why not?

- Does the learner perform the way he was taught?
  - ☐ If not, why not?
ADDIE: Feedback

--Feedback refers to continuous review and evaluation of the instruction. The course design process is dynamic, not static.
Summary: The ADDIE Model

Analyze  Design  Develop  Implement  Evaluate

Feedback Loop*

*-- establishes the model as a system
A Few Key Principles to Remember

- Not all problems can be solved by training
- Focus on what the learner must do or know first; how and what you will teach second
- Problem-based tests and lessons are most likely to influence transfer
- It’s a system; components interact
- If they can’t transfer the skills to the workplace, what good is it?
Go Forth and Do Good Training!

Thank you!