Skills Based Curriculum Development

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Curriculum Consultant

Common Curriculum Errors

◆ Failure to teach WHAT should be taught
  (e.g., the latest skills & concepts)
◆ Teaching WHAT should not be taught
  (e.g., outdated skills & equipment)
Should We Teach --

- What we know best?
- What we were taught?
- What we enjoy teaching?
- What we have experience with?
- What the textbook happens to include?

OR

- What the student/worker most needs for successful employment?

What is DACUM?

An Acronym for Developing A Curriculum

A Process for:

- Job Analysis
  - single job
- Occupational Analysis
  - multiple related jobs
- Process Analysis
  - multiple categories of jobs
- Conceptual Analysis

Used by:

- Secondary & Post-Secondary Educators
- Business-Industry Trainers
- Government-Military Trainers

- Effective
- Quick
- Low Cost
Who Uses DACUM?

- American Electric Power
- AT & T Wireless
- Boeing
- Cingular Wireless
- Coors Brewing
- Eastman Kodak
- Ericsson
- Honda
- John Deere
- General Mills
- University of Pennsylvania
- Oklahoma State University
- University of Central Florida
- Lucent Technologies
- Motorola
- Sterling Commerce
- UAW Ford
- United Airlines
- Walt Disney World
- Westinghouse
- Johnson and Wales
- Ohio State University
- North Dakota State
- Bowling Green State
- Temple University

DACUM Philosophy

を持っている職員が自分の仕事についてより正確に説明し、定義することのできる人には誰よりも正確に職業を説明できる。

- An effective way to define a job is to precisely describe the tasks that expert workers perform.

- All tasks, in order to be performed correctly, demand certain knowledge, skills, tools, and worker behaviors (enablers)
The DACUM Process

- ~12 expert workers
- Hotel Conference room
- 2 days

DACUM Workshop

- Meals & Refreshments
- Facilitator
- Note Taker
DACUM Procedure

1. Orient the committee
2. Review the job/occupation
   A) Develop Organizational Chart
   B) Conduct initial brainstorming
3. Identify duties (general areas of responsibility)
4. Identify specific tasks performed
5. List:
   A) General knowledge & skill requirements of the job
   B) Worker behaviors (desirable attitudes and traits)
   C) Tools, equipment, supplies, and materials
   D) Future trends/concerns
6. Review/refine task and duty statements
7. Sequence the task and duty statements
8. Rank the duty & task statements (Tech I, Tech II, Tech III)

Graphic Representation of Job, Duty, and Task Relationships

Whole Job

Job Divided into Duties (6-12)

Job Divided into Duties & Tasks (75-125)
### Job, Duty, Task, and Step Examples

<table>
<thead>
<tr>
<th>JOB</th>
<th>- Homeowner</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUTY</td>
<td>- Maintain the yard</td>
</tr>
<tr>
<td>TASK</td>
<td>- Mow the lawn</td>
</tr>
<tr>
<td>STEP</td>
<td>- Start the mower</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>JOB</th>
<th>- Homemaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>DUTY</td>
<td>- Prepare meals</td>
</tr>
<tr>
<td>TASK</td>
<td>- Bake cookies</td>
</tr>
<tr>
<td>STEP</td>
<td>- Mix ingredients</td>
</tr>
</tbody>
</table>

### Key Terms

- **Duties** - A cluster of related tasks  
  Usually 6-12 per job

- **Tasks** - Specific meaningful units of work  
  Usually 6-20 per duty and 75-125 per job

- **Steps** - Specific elements or activities required to perform a task  
  Always two or more per task
Duty Statement Criteria

**Duty Statements:**

- Describe large areas of work in performance terms
- Consist of one verb, an object, and usually a qualifier
- Stand alone (are meaningful without reference to the job)
- Serve as title for a cluster of related tasks (usually 6-20/duty)
- Are general, not specific, statements of the work that is performed (usually 6-12/job)
- Avoid references to workers behaviors, tools, and knowledge needed

Sample Duty Statements

- Create / Acquire Data
- Maintain / Manage Data
- Analyze Data
- Technical Support
- Generate Products
- Manage Projects
**Job Task Criteria**

**Job Tasks:**
- Represent the smallest unit of job activity with a meaningful outcome
- Represent an assignable unit of work
- Can be performed over a short period of time
- Can be performed independent of other tasks
- Result in a product, service, or decision
- Have a definite beginning and ending point
- Can be observed and measured
- Consist of two or more steps

**Sample Task Statements**

- Create maps
- Geocode address data
- Refresh / replace layers
- Edit GIS data
- Develop databases
- Write / review technical reports
DACUM Advantages

- Employee involvement and buy-in
- Use of Expert Workers / Panel members
- Efficient: 2 days vs. 6 weeks
- Specific vs. general job specifications
- Identification of critical tasks
- Opportunity for brainstorming & sharing ideas
- Group Consensus / Synergy
- Solid foundation for the Curriculum Development Process
A-3: Task Verification

<table>
<thead>
<tr>
<th>TASK Rating</th>
<th>1. Do you perform this task?</th>
<th>2. How important is this task in the performance of your job (Circle ONE response)</th>
<th>3. What is the learning difficulty of this task in your job (Circle ONE response)</th>
<th>4. Is this required at every level?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duty: Generate GIS Products (hard copy, electronic)</td>
<td>Yes</td>
<td>No</td>
<td>Importance</td>
<td>Great importance</td>
</tr>
<tr>
<td>E-1: Create maps</td>
<td>Y</td>
<td>N</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>E-2: Create analysis reports</td>
<td>Y</td>
<td>N</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>E-3: Create charts</td>
<td>Y</td>
<td>N</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>E-4: Create tables</td>
<td>Y</td>
<td>N</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>E-5: Generate mailing labels</td>
<td>Y</td>
<td>N</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Mailed to 150 GIS Professionals in San Diego County - 75 respondents

A-4: Select Tasks for Training

Results of Task Verification Survey
GIS Technician
San Diego Mesa College, Sept. 2005

<table>
<thead>
<tr>
<th>Duty E: Generate GIS Products (hard copy, electronic)</th>
<th>Perform</th>
<th>Importance</th>
<th>Learning Difficulty</th>
<th>Required</th>
<th>Overall</th>
<th>Include in Curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-1: Create maps</td>
<td>99%</td>
<td>93%</td>
<td>64%</td>
<td>98%</td>
<td>68%</td>
<td>Y</td>
</tr>
<tr>
<td>E-2: Create analysis reports</td>
<td>79%</td>
<td>77%</td>
<td>59%</td>
<td>69%</td>
<td>70%</td>
<td>Y</td>
</tr>
<tr>
<td>E-3: Create charts</td>
<td>84%</td>
<td>79%</td>
<td>53%</td>
<td>60%</td>
<td>72%</td>
<td>Y</td>
</tr>
<tr>
<td>E-4: Create tables</td>
<td>77%</td>
<td>73%</td>
<td>50%</td>
<td>66%</td>
<td>68%</td>
<td>Y</td>
</tr>
<tr>
<td>E-5: Generate mailing labels</td>
<td>69%</td>
<td>73%</td>
<td>57%</td>
<td>67%</td>
<td>67%</td>
<td>Y</td>
</tr>
<tr>
<td>E-6: Create graphic items (e.g., logos, headers, posters, exhibits)</td>
<td>72%</td>
<td>54%</td>
<td>43%</td>
<td>62%</td>
<td>64%</td>
<td>Y</td>
</tr>
<tr>
<td>Summary: Duty E</td>
<td>74%</td>
<td>72%</td>
<td>58%</td>
<td>74%</td>
<td>69%</td>
<td>Y</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duty F: Develop Software Applications</th>
<th>Perform</th>
<th>Importance</th>
<th>Learning Difficulty</th>
<th>Required</th>
<th>Overall</th>
<th>Include in Curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>F-1: Create map templates</td>
<td>73%</td>
<td>69%</td>
<td>63%</td>
<td>70%</td>
<td>70%</td>
<td>Y</td>
</tr>
<tr>
<td>F-2: QVOC software applications (e.g. beta test)</td>
<td>52%</td>
<td>51%</td>
<td>70%</td>
<td>43%</td>
<td>54%</td>
<td>Y</td>
</tr>
<tr>
<td>F-3: Define user software needs</td>
<td>43%</td>
<td>55%</td>
<td>71%</td>
<td>19%</td>
<td>47%</td>
<td>Y</td>
</tr>
<tr>
<td>F-4: Customize commercial software</td>
<td>34%</td>
<td>37%</td>
<td>78%</td>
<td>10%</td>
<td>40%</td>
<td>Y</td>
</tr>
<tr>
<td>F-5: Build Help files</td>
<td>31%</td>
<td>44%</td>
<td>64%</td>
<td>33%</td>
<td>44%</td>
<td>N</td>
</tr>
<tr>
<td>F-6: Enhance existing custom applications</td>
<td>35%</td>
<td>40%</td>
<td>79%</td>
<td>10%</td>
<td>42%</td>
<td>N</td>
</tr>
<tr>
<td>F-7: Develop software applications</td>
<td>23%</td>
<td>49%</td>
<td>80%</td>
<td>0%</td>
<td>40%</td>
<td>N</td>
</tr>
<tr>
<td>F-8: Determine application document format (e.g., platform, language)</td>
<td>28%</td>
<td>30%</td>
<td>70%</td>
<td>4%</td>
<td>39%</td>
<td>N</td>
</tr>
<tr>
<td>Summary: Duty F</td>
<td>43%</td>
<td>53%</td>
<td>73%</td>
<td>28%</td>
<td>48%</td>
<td>Y</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Duty G: Manage GIS Data</th>
<th>Perform</th>
<th>Importance</th>
<th>Learning Difficulty</th>
<th>Required</th>
<th>Overall</th>
<th>Include in Curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>G-1: Review data</td>
<td>82%</td>
<td>80%</td>
<td>50%</td>
<td>69%</td>
<td>71%</td>
<td>Y</td>
</tr>
<tr>
<td>G-2: Archive / retrieve data</td>
<td>79%</td>
<td>70%</td>
<td>50%</td>
<td>68%</td>
<td>67%</td>
<td>Y</td>
</tr>
<tr>
<td>G-3: Create data</td>
<td>80%</td>
<td>65%</td>
<td>69%</td>
<td>50%</td>
<td>69%</td>
<td>Y</td>
</tr>
</tbody>
</table>

11
**A-5: Task Analysis**

<table>
<thead>
<tr>
<th>STEPS (necessary for performing task)</th>
<th>PERFORMANCE STANDARDS (Observable &amp; Measurable Criteria)</th>
<th>TOOLS, EQUIPMENT, MATERIALS &amp; SUPPLIES</th>
<th>RELATED RESOURCES (e.g., articles, books, websites, data, exercises)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Observe demonstration of GPS setup, GPS menu, satellite constellation, scale, zoom, pan, compass direction functionality, and data collection</td>
<td>Demonstrate correct GPS setup according to instructions, including coordinate system</td>
<td>Garmin GPS Map, etc., software and cables, Google Earth, etc. or higher</td>
<td>Instruction to GPS, using manuals, etc.; <a href="http://www.ca.gov.erdmower/gps/gps_guides">http://www.ca.gov.erdmower/gps/gps_guides</a>, module pdf Student handbook of relevant directions for activities performed in this exercise and/or Garmin instruction booklet and/or digital direction file (including menu navigation, preferred coordinate system)</td>
</tr>
<tr>
<td>2. Receive GPS units and prepare GPS units for use according to GPS instructions</td>
<td></td>
<td></td>
<td>Reference online resources, books, articles</td>
</tr>
<tr>
<td>3. Receive description of features for which data will be collected (e.g., signs, plants, benches, etc.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Collect waypoints outside of classroom for these features, with minimum of 4 satellites distributed evenly (PODPT?)</td>
<td>Record satellite strength and positional accuracy from GPS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. In classroom observe demonstration of Garmin software, displaying data in Google Earth and download and export data to shapefile</td>
<td>Answer questions on key points concerning data downloading and exporting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Connect GPS in classroom computer using Garmin cable</td>
<td>Window display demonstrates that GPS is properly connected</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Display GPS data in Google Earth and evaluate accuracy</td>
<td>Observe locational accuracy of waypoints</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**Phase B: Curriculum Design**

- **B-1: Determine Training Approach**
  - Performance/Competency Based

- **B-2: Develop Learning Objectives**
  - Translate Tasks/Competencies into Objectives (sequence)

- **B-3: Develop Performance Measures**
  - Knowledge & Skills Assessment tools

- **B-4: Develop Training Plan**
  - Curriculum Approval
B-1: Determine Training Approach

**Competency Based Program**
- Competencies must be made public
- Criteria for assessment must be clear
- Accommodate different learning styles & abilities
- Task performance is primary method of assessment
- Learners progress at their own speed

B-2: Develop Learning Objectives

**Performance Objective:**
- specifies final outcome of an instructional activity
- Eg: *Given a Garmin GPS Map 60 and ArcGIS, collect site locations for xxx and display these on a cartographically correct map showing xxx*

**Enabling Objectives:**
- Support achievement of Performance Objective
- *Eg: gain knowledge of: (1)Garmin GPS Map 60, (2)cartography, (3)data transfer to ArcGIS*
B-3: Develop Performance Measures

- Knowledge Assessment
  - Testing
- Skills / Performance Assessment

B-4: Develop Training Plan

- Curriculum Approval
- Budget
- Tools, Equipment & Supplies
- Student Recruitment
- Staffing
C: Curriculum Development

- C-1: Develop Competency Profile
  - Map Tasks to Modules / Courses
- C-2: Develop Learning Guides
- C-4: Develop Supportive Media
- C-5: Pilot Test

LEARNING GUIDE

PROGRAM TITLE: GIS Certificate Program
DUTY: Create GIS data

TASK/COMPETENCY: Create GIS data

INTRODUCTION: GIS is a tool used for the management and analysis of spatial data. This guide will provide you with the knowledge and skills necessary to create a GIS database.

PERFORMANCE OBJECTIVES:

Given a reference data set and a list of addresses, generate the addresses as if to meet the requirements of the performance test.

ENABLING OBJECTIVES:

1. Gain knowledge of the geographic processing
2. Practice generating addresses

PREREQUISITES, IF ANY:

- Ability to work with the Windows operating system
- Knowledge of basic cartography

Phases D & E:
Implementation & Evaluation

- Faculty Training
- Evaluate Feedback
- Document Results
- Program Update & Improvement