

CFD: Competency Framework Development

Introduction

This document details a method for *competency-based framework development* (CFD) for instruction related to a job or job function (called a “job” in this document). Frameworks can be used to

- Design new courses or analyze and update existing courses;
- Help learners find the best material to use to meet a professional goal;
- Issue competency-based credentials or otherwise certify that a learner has demonstrated a set of skills or is qualified to perform a task.

CFD is intended to tap into the knowledge of *practitioners* (people who do the job, not who write about it or instruct it) in a systematic way that can be facilitated online. It is based on a combination of instructional systems design (ISD), curriculum design, and skills identification methods and borrows concepts and techniques from all of these.

Outputs

CFD results in two major artifacts:

- 1) A structured set of competencies and “terminal learning objectives” (TLOs)
- 2) Representative assessment methods associated with each competency and TLO

If a course is being analyzed or designed, these can be used to map course components to competencies, to identify which competencies are assessed where, and to produce credentials associated with the course or with a program of study. In this case the third artifact produced is

- 3) A mapping of course components to competencies and assessments of competencies

Theoretical Framework

At the heart of CFD are abstractions called *competencies*. A competency is a *skill, knowledge, or ability*. These are defined and characterized as follows:

- A *skill* is the capacity to effectively apply knowledge and abilities to perform a task, type of task, or set of tasks. A skill can be expressed in the form of a *skill statement* of the form *action verb – object – (modifier)*, where the modifier is optional. To be a skill, the capacity must be learnable or trainable (a person or organization must be able to acquire it through education or training) and it must be measurable, meaning there must be an assessment that can be used to determine whether a person or organization has the skill.

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Example: Skills for an Uber driver include “use the Uber app,” “enter a destination into the Uber app,” “determine the most profitable times to drive,” “obey traffic rules,” and “recognize inebriated passengers.” These can all be learned and assessed.

- *Knowledge* consists of facts, principles, and beliefs that can be expressed as declarative statements and that can be transmitted to others and acquired from others via communication.

Example: “Uber requires that you use the Uber app” and “Inebriated passengers are dangerous,” are knowledge. You can acquire this knowledge by reading the statements. This is very different from learning to use the Uber app, or recognizing inebriated passengers,” which are skills that you cannot acquire simply by reading them. Even reading all of the instructions for using an app is unlikely to transfer immediately into the ability to use it because, as a basic principle, knowledge does not equal behavior, and skills are about behavior, not knowledge.

- An *ability* is the same as innate capacity of an individual that is relevant to the performance of a task, type of task, or set of tasks. Abilities may improve with training, but they cannot be acquired through training. Abilities are often expressed as nouns (e.g. “20-20 vision” or “dexterity” or “strength”)

Assessment

To be part of a competency framework, a competency must be assessable. The type of assessments that are appropriate to skills, knowledge, and abilities vary and can be defined using Bloom’s taxonomy (or equivalent taxonomies).

Knowledge is assessed by recall or explanation. Typical “knowledge checks” include True/False questions that ask whether some variation of the declarative statement that defines a fact, principle, or believe is true or false, or multiple choice questions that ask a learner to identify the correct statement among multiple choices. These are assessment by recall. Explanatory assessment asks a learner “how” and “why” questions and is associated with “deep learning” as opposed to memorization. In the Uber driver example, asking “True or False: Inebriated passengers are dangerous” is assessment through recall. Asking “Why are inebriated passengers dangerous?” is assessment through explanation. Note that if knowledge can be assessed by explanation, then it can be turned into a skill statement of the form “Explain why” or “Explain how,” e.g. “explain why inebriated passengers are dangerous.”

Skills cannot be assessed by recall and should not be assessed by explanation. Instead, they should normally be assessed by application or analysis and potentially by evaluation and synthesis. To assess a behavior, it is considered best practice to provide a scenario in which the behavior can be exhibited or not. Thus to determine whether a learner can “use the Uber app,” it would be ideal to watch the learner interact with the app (or a simulation of the app). In practice,

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this is substituted by assessments that ask for explanations, e.g. “How do you enter your destination into the Uber app,” “What do you do if the Uber app does not show a route?” These are assessments of the knowledge that is required for the proper behavior, and are valid only to the extent that they translate into behaviors with high probability. Assessment through analysis occurs when the learner is asked questions such as “Alice saw a request for a ride and responded but when she got to her ride’s location, the ride was not there. What might have happened?”

Abilities are rarely assessed as part of a course or curriculum, but if they are, they are measured directly, or are implicitly assessed as part of skills assessment.

Indicators: An *indicator* of competency is a behavior that provides positive evidence of the competency. In general, no assessment can prove that someone has a competency; it can only provide evidence. An Uber driver could obey every traffic law in a test drive but still not know that in Oregon it is the law that drivers must move over to a non-adjacent lane (or slow down) when approaching the rear of a tow truck or roadside assistance vehicle that is providing assistance to a disabled vehicle on the roadway. In real-world competency frameworks, such as those provided by manufacturing professional organizations, the competencies stated are at the TLO level, or just below it, and are assessed by looking at a number of indicators rather than assessed directly. Thus “obey traffic laws,” is assessed by observing that a driver obeys a small subset of all traffic laws, but not all of them.

Competencies, Objectives, and Outcomes

In the context of instruction, competencies are closely related to *learning objectives* or *learning outcomes*. Learning outcomes explicitly state what a learner should be able to do as a result of the instruction and are expressed using the same type of language as skill statements. Thus an outcome for an Uber driving course might be “Use the Uber app to find riders, calculate routes, and report charges.” Note that this can be construed as combining several skills, each which may be assessed separately, and is at level of granularity just below the overall objective of the course.

In many ISD paradigms, course objectives are broken into “enabling” and “terminal” objectives. In the above example, the terminal objective might be “demonstrate proficiency in using the Uber app,” while “use the app to find riders” and “use the app to calculate routes” might be two enabling objectives. Other enabling objectives might be “demonstrate familiarity with the Uber app interface” or “identify which direction is North on Uber maps.”

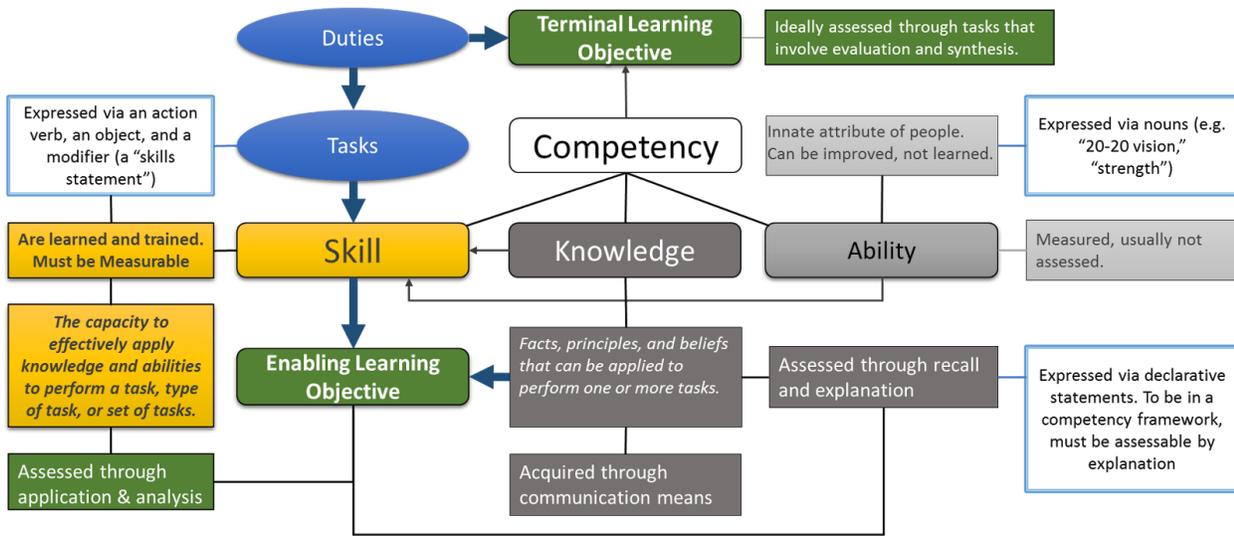
Relationship to DACUM

DACUM is a process for defining a curriculum to train learners to do a specific job (e.g. be an Uber driver). The process we propose incorporates many of the same principles used by

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DACUM and other task analysis processes. The output of DACUM includes a decomposition of a job into a set of “duties” (things you might put on a resume and be paid for), each of which consists of a set of “tasks” which, in turn, are broken down into steps.

DACUM tasks correspond closely to skills and are expressed using the same type of “action verb + object” statement. Steps are often indicators and in general are too fine-grained to be considered skills in a competency framework. DACUM duties are closely related to terminal learning objectives (TLOs). In a course, these often correspond to sub-units such as modules, chapters, or lessons. This picture is illustrated in Figure 1 (next page).



Granularity and Relevance

For the purpose of CFD, a competency must be (a) needed or strongly desired for the job and (b) at a level of *granularity* that is appropriate for defining or analyzing course components. In ISD terms, they must be associated with ELOs.

Developing a Competency Framework

The goal of the CFD process is to develop a competency framework for a job or function. This is done through a series of online sessions with practitioners informed by distillations of pre-existing materials. The leader of this process is referred to as the *facilitator*. The discrete steps in CFD are:

1. Gather materials: *Research sources of relevant competency framework information.*
2. Recruit practitioners: *Arrange for 4 – 7 practitioners to participate in CFD.*
3. Distill materials: *Use materials to develop potential competencies and assessments.*

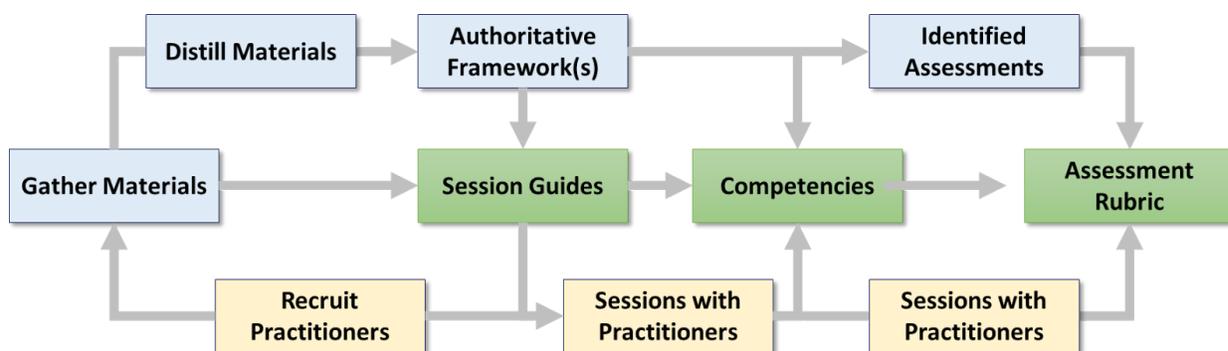
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4. Engage with practitioners: *Facilitate structured online sessions to develop competencies.*
5. Engage with practitioners: *Facilitate structured online sessions to develop assessments.*
6. Publish framework: *Publish resulting competencies and assessment rubric.*

If an existing course is being analyzed, the additional steps are:

7. Develop competency rubric for course: *Map course components to competencies.*
8. Modify course: *Modify assessments (and content) to focus on competencies / outcomes.*

These steps are detailed in this section.



Tools

Since CFD is intended to be a “virtual” process, it uses online collaborative tools.

- “Documents” and “spreadsheets” and “presentations” are all Google docs.
- “Meetings” take place using a collaboration tool that allows for live virtual interaction, hand-raising, polling, and video (so that participants can see each other).

Practitioner Recruitment and Commitment

Practitioners are at the core of the CFD process. Sessions ideally have 4 – 6 practitioners, although 3-person or even 2-person sessions are plausible. More than six is not recommended as this becomes unwieldy online, but if the facilitator has the good fortune to have access to a larger group, practitioners who do not participate in online sessions can be used as reviewers.

Each practitioner must be prepared to spend between TBD and TBD hours on the CFD process over an approximately two-week period.

Gathering Pre-existing Materials

The goals of analyzing pre-existing materials are:

- Increase CFD facilitator’s subject knowledge;

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- Start communication, collaboration and “norming” among practitioners;
- Create materials that can make the process more efficient; and
- Avoid conflicts with authoritative sources.

To be useful, these materials should:

- Directly address the job or function for which a framework is being developed;
- Explicitly state job functions, tasks, skills, learning objective or learning outcomes;
- Come from a valid and reliable source that consists of or represents practitioners.

Useful materials include:

- Outputs of a DACUM process related to the job or function;
- Certification standards developed by a legitimate professional association;
- Well-designed instructional materials that include objectives and outcomes;
- Informal discussion of the job or function produced by and for practitioners.

It is recommended that the CFD facilitator enlist the aid of practitioners in identifying potential materials and perform the usual research via Google and other sources. It is *not* necessary for the facilitator to be an expert in the job to do this, and the facilitator should stay away materials that practitioners do not consider to be mainstream.

All materials should be reviewed with practitioners for relevance to the job. This serves two purposes. First, it provides input on an important criterion for their use. Second, it familiarizes the practitioners with the materials, i.e. serves a “norming” purpose.

It may be that no suitable pre-existing materials exist. This is not a problem and, in fact, makes the output of the CFD process more valuable. The facilitator should nonetheless go through the process of gathering and eliminating materials to become familiar with the job and the practitioners who will participate in the process.

Analysis of Materials

If suitable materials have been found and vetted by practitioners, they should can be used to develop a candidate set of competencies and associated indicators. These competencies should be gathered into a *competency spreadsheet* in which each competency has:

- ID
- Type (skill, knowledge, ability, TLO)
- For a skill or TLO
 - Verb
 - Object and modifier
- For a knowledge or ability: A statement or known
- List of indicators

This is done by the facilitator and not in a group session. The facilitator may engage with one or more practitioners on calls or online sessions to ask advice, but this is not the main group

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activity. The facilitator should be careful not to inject hidden biases into this list and should avoid relying on the perspective of a single practitioner. The objective is to translate authoritative information into a format that can be used in the CFD process, not to define new competencies.

Session Guides

Session guides are materials that the facilitator uses to explain the CFD process and, as the name indicates, guide practitioner sessions. The majority of content in a session guide is generic; it does not change with the job being analyzed. However, it is recommended that examples from the area of interest be used if they are available. These can be gathered from the existing materials and the competency spreadsheets.

Practitioner Sessions

General: All sessions are consensus-driven. Sessions should generally be scheduled for two hours but may be scheduled for shorter periods at the discretion of the facilitator.

Introduction: The first practitioner session is an introduction to the CFD process. The facilitator goes through the introductory material with the goal of making it clear what is and is not a competency and how to define skills, knowledge, abilities and TLOs. No competencies will be defined for the job during this session. The Session Guides include quizzes that will help determine whether this concept is grasped and will serve to model assessment techniques.

TLO Development Session: TLOs should be developed using a consensus-driven process. Practitioners suggest TLOs in a round robin. The guidance is 6 – 15 TLOs total. Pre-existing TLOs should be examined first. The group may decide to use or modify them, or just to use them as suggestions. One session should suffice to develop TLOs, but an additional session may be scheduled as needed. *ONLY TLOs should be developed. If other competencies are identified or suggested, they should be recorded in a competency spreadsheet for later use.*

Competency Development Session: Each TLO should be broken down into competencies. Competencies may appear in more than one TLO. A facilitated round robin suggestion process is used. The facilitator should limit the time spent on each TLO to 15 minutes. One or two sessions will be required depending on the number of TLOs.

Offline Review: Each practitioner will be given the assignment of:

- Reviewing the competency framework; and
- Suggesting indicators for each competency.

Practitioners may comment on competencies. A form should be used to suggest indicators.

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Assessments: Facilitator will run a session in which assessments methods are developed for each TLO and competency. The facilitator will review how to express assessment types and how to derive assessments from competencies and from indicators.

For each TLO, the group will decide whether:

- The TLO is assessed separately from its sub-competencies;
- The TLO is assessed by assessing all of its sub-competencies (all are required)
- The TLO is assessed using sub-competencies but with a more complex rule, e.g. 75% must be demonstrated, or two specific ones and 50% of the rest must be demonstrated.

The facilitator will then lead the exercise of identifying assessment for each competency. This is intended to be a single session. Participants will then complete and review this task on their own.