CETE Updated Expertise Brief 2019:

The Use of Job Analysis Data in Constructing Tests of Job Knowledge

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CETE has developed and / or delivered tests of job or occupational knowledge for a wide variety of settings, from employment (for personnel selection, promotion, placement, and evaluating learning effectiveness or deficiencies) to education and workforce development (secondary and postsecondary career-technical education, training programs) and credentialing (licensure and certification).

One requirement common to all of these settings is content validity – do the test forms represent samples of the job or occupation? Demonstration of evidence for content validity additionally supports defensibility if a complaint or legal challenge occurs. To establish job-relatedness, test specifications or blueprints must be linked to data derived from a job or practice analysis. This requirement is supported in professional standards that provide guidance on the development of occupationally-related assessments, such as the *Standards for Educational & Psychological Testing* (2014), *Principles for Validation & Use of Personnel Selection Procedures* (2018), *Uniform Guidelines for Employee Selection Procedures* (1978) and the *NCCA Standards for the Accreditation of Certification Programs* (2014). Job analysis data is the most common basis for establishing content validity of occupation- or job-related tests. A job analysis or practice analysis is the foundation of the test. It defines the content domain or body of knowledge; yields evidence for interpreting scores, and provides evidence for validity as well as defensibility

An important consideration is that the method of job analysis chosen fits the purpose of the job knowledge test. Selected methods include DACUM (often used to develop training & curriculum, but also used by a majority of personnel certifications), WRIPAC (often used to develop selection tests), Job Profiling (ACT Job to Work Keys maps), SHL Work Profiling System (standardized, computerized approach), O*Net (general occupational focus as opposed to the job-specific Dictionary of Occupational Titles), and the Position Description Questionnaire (PAQ, standardized approach). Practice analysis (Raymond, 2001, 2005) is often distinguished from job analysis in that it is an examination of practice across the occupation rather than a specific job in a specific organization. A published example of a practice analysis, focusing on Lamaze childbirth educators for a certification, is Budin, Gross, Lothian, and Mendelson (2014).

A task inventory approach such as DACUM or WRIPAC is commonly used in test development. One decision point in the use of job analysis data is whether or not to use the tasks, or instead use the knowledge, skills, and abilities (KSAs) in linking job analysis results to test content. Wang, Schnipke, and Witt (2005) advocate the use of KSAs in establishing the linkage. CETE staff often use a combination of tasks and the KSAs linked to those tasks in developing tests.

The goal is to develop a test specification that indicates the "weight" assigned to the content to be tested. For various reasons, the surveys used to gather the data generally focus on the tasks rather than the KSAs (Raymond, 2005). The data is gathered through task verification surveys in which job incumbents are asked to indicate the relative criticality of each task to the job. A number of questions may be asked on the survey to measure task criticality. Most often overall

importance of the task to the job is one rating. Another common rating is frequency at which the task is performed. Other possible ratings include: needed at job entry (yes/no), level of responsibility, task difficulty, and consequences of deficient performance.

CETE staff typically uses task importance and task frequency, each on a 0-5 (6-point) scale. A "criticality" variable is calculated by multiplying each individual's response to these rating items creating a within-person criticality indicator for each task. The individual's criticality variable is then averaged across individuals to provide the task's criticality "weight". The following table illustrates how these derived criticality variables are used in creating a proportional number of items for one task cluster or duty: Determine Customer Needs. The criticality is summed across all tasks. Each individual task criticality is divided by this sum and multiplied by 100 to create the percent of criticality carried by the task. This percent is then multiplied by the total number of items desired, to derive the number of items to be written for that task. The number of items for each task of an imaginary 40-item subtest is given in the right column of the table, and ranges from 2 to 10. The tasks, along with their linked KSAs and the number of items required are used by the item writers and facilitators in the test specifications.

Table 1
Example Test Specification

#	**Task Statement**	**Criticality**	%	# Items for a 40-item subtest
1	Respond to customer contact	15.33	(15.33/70.22)*100 = 21.83%	.2183*40 =9
2	Obtain basic customer information	12.57	17.90%	7
3	Assess current water situation	8.07	11.49%	5
4	Obtain customer water system needs (e.g., # occupants)	6.65	9.47%	4
5	Question customer about water problem	18.30	26.06%	10
6	Troubleshoot water problem over phone	5.59	7.96%	3
7	Arrange for site visit	3.71	5.28%	2
	Sum	**70.22**	**100%**	**40**

Multi-dimensional test specifications can be created by the addition of other factors, such as cognitive levels required by pre-determined proportions of test items (Bloom et al., Marzano-Kendall, or Webb's Depth of Knowledge).

A spreadsheet used by CETE to create test blueprints from criticality is available upon email request to James T. Austin at austin.38@osu.edu.

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