Report created and presented to the
*National Center for O*NET Development, March 2011*

Summary of Procedures for O*NET Task Updating and New Task Generation

Prepared by:

Erich C. Dierdorff, Ph.D.
North Carolina State University & DePaul University
Jennifer J. Norton, M.S.
North Carolina State University

Overview

This report describes the processes and procedures for updating and writing O*NET tasks. Efforts to update and write tasks seek to accomplish two broad goals: (1) revision of existing O*NET tasks when necessary and (2) creation of new tasks (e.g., New and Emerging (N&E) tasks and Green tasks). Enhancing O*NET task data generally entails several actions that include researching, reviewing, revising, and writing task statements for use in the O*NET system. Throughout these actions, Internet-based information sources serve a primary role in supporting and informing task revision and writing. Utilization of online resources to collect task data is intended to be more expedient, more manageable, and less costly than other methods such as direct surveying.

Broadly speaking, the task updating and writing procedures follow a series of successive stages. Each of these stages involves subjecting collected Internet-based task information to an ever-increasing degree of filtering. The collected task information is first filtered for duplication and redundancy of content. Then, this newly collected task information that is unique to the tasks already contained in the O*NET system is rationally clustered to cumulate its content. New tasks are written from all formed clusters. Also note that collected task information that is not unique to the O*NET system may be used to revise existing O*NET tasks. Specialized training that ensures quality is received by task developers. Also, extensive quality control checks are embedded throughout the process. These stages are described in the sections that follow.

Ensuring Quality

Prior to beginning the data collection, individuals responsible for task updating and writing receive specialized training. Note that the individuals performing this work have graduate degrees in Industrial-Organizational Psychology and substantial knowledge of occupational information. The purpose of this initial training is as an orientation to the ultimate goals of task updating and writing, as well as to teach the necessary knowledge and skills for successful performance. The focus of this training is two-fold. First, training documentation is reviewed regarding the use of various Internet technologies (e.g., web browsers, file sharing websites, cloud computing, etc.). Second, instruction and documentation are delivered that directly address issues surrounding the definition and classification of the world of work. More specifically, individuals are required to review background information about occupational terminology in order to establish a common frame of reference and language for task updating. Additionally, these documents are available as resource guides for ensuing work assignments (see Appendix for an example of such documentation). To specifically aid in each project stage, individuals are required to review formal heuristics for each stage, complete practice exercises, and receive performance feedback.

Description of Procedural Stages

The general procedure for task updating is sequentially designed to gather task-related information for O*NET occupations selected for updating, to screen task-related information, and to write and/or revise tasks to be added to the O*NET database. This procedure follows six stages described below.

Task Searching Stage

As the initial step, the main purpose of the task searching stage is to capture task-related data to be used in ensuing updating processes. Internet-based data collection is the primary input for this stage. Task searching occurs across two tiers.

- **Tier 1:** This search phase focuses on specific types of websites most likely to provide relevant occupational information. Such websites include state employment databases, career information websites, and professional association websites affiliated with the targeted occupation.

- **Tier 2:** This search phase utilizes “free searching” with keywords such as occupational titles. Occupations for which insufficient amounts of data are collected in Tier 1 are subjected to Tier 2 searching. Search engines (e.g., Google, Bing, etc.) are employed to research Internet-based sources that provide potential task-related data. Examples of sources often found in this phase of searching include job descriptions and

postings, training guides and curricula, certification requirements, and tools and technology used in the focal occupation.

Collected task-related information is either directly recorded or slightly revised to render more interpretable task-based data (e.g., in the case of tool or technology usage, a very rough task might be written and recorded). For each web-based record, the website source, occupational title used in the search, and the URL of the website is documented.

Task Matching Stage

The purpose of the task matching stage is to filter through the large amount of task-related information collected during the previous stage. More specifically, each web-based record ("web task information") for a given occupation is compared to those tasks that already exist within in the O*NET database. The product of task matching is a categorization or rating of each piece of web task information for a given occupation as:

a) Duplicative of a preexisting O*NET task ("O-task");
b) Unique relative to all of the O-tasks; or,
c) Overlapping an O-task but still providing additional content information.

Task Sorting Stage

In this stage all of the web task information that is judged "unique" for an occupation within the previous stage is sorted into clusters. A cluster represents a grouping of task information that shares a meaningful interrelationship, such as a common action or purpose. Web task information is sorted into clusters based on their communalities. The primary purpose for clustering the unique web task information is to create groupings of content-similar information that can then be used to write new tasks for entry into the O*NET database. For each created cluster, one to three new tasks are typically composed. Thus, the goal of task sorting is to group web task information that is similar in content in order to develop a smaller number of task statements. This procedure is reminiscent of Q-sorting or card sorting.

Task Writing Stage

During the task writing stage, summary tasks are written directly from the clusters generated in the previous stage. The goal of task writing is to create a summary task(s) for each cluster that incorporates, or summarizes, the information provided by the cluster's constituents. The primary aim of this stage is to create grammatically correct, standardized summary tasks for all clusters of a given occupation. Editing of the summary tasks is performed at a later stage. Emphasis is placed on writing as few summary tasks as possible for a given cluster – a single task is preferable, but up to five summary tasks are allowed.

Task Revision Stage

The purpose of the revision stage is to review and update existing tasks within the O*NET database ("O-tasks") utilizing information from collected web task information. More specifically, O-tasks for a given occupation are compared with any web task information that has been matched to each of those O-tasks. These matched tasks include the web task information produced during the task matching stage when web task information is rated as a partial overlap to a given O-task (see option 'c' under task matching stage). This review entails deciding whether or not an O-task is in need of revision based upon the content of the overlapping web task information. If a revision is deemed necessary, the O-task is rewritten to reflect the new information.

Task Editing Stage

This final project stage involves the final review of the pooled task data. Thus far task data have been gathered, matched, clustered, written, and revised. The task editing stage entails a holistic examination of each occupation's list of tasks. Editing occurs as two general types described in the ensuing paragraphs. Type I editing handles the more substantial load of editorial changes. Type II editing is performed by process experts upon all occupations in order to ensure a final task quality.

Type I Editing. The main purpose of Type I editing is to prepare the final task lists for selected occupations. This editing is meant to ensure a standard "look and feel" across all of the finalized tasks (i.e., sentence structure, grammar, etc.). Additionally, those occupations that contain problem tasks or an excessive number of total tasks are flagged for Type II editorial review. Next, all finalized tasks are coded and sequenced according to three broad categories, as described in item 4 below. Finally, the edited tasks are used to populate a specially designed data table suitable for transfer to the main O*NET database. In order to facilitate expediency and ease, Type I editing occurs as four successive tiers. Each of these tiers and their respective goals and decision points is discussed below.

1. **Task Deletion:** Conducted to eliminate any incomplete, redundant, useless, irrelevant, or contradictory tasks that have not already been removed during previous stages.

2. **Task Separation:** Conducted to break out any tasks that contain too much information. In other words, tasks containing content that is too variable to provide a succinct, interpretable generic statement. Tasks that are split are written as separate task statements

3. **Task Joining:** Conducted to combine any tasks that are too similar in content to be stand-alone final tasks and/or to roll-up "support tasks" and "TEWA" (tools, equipment, work aids) tasks into single statements

4. **Final Review/Editing:** Conducted to flag problem tasks for Type II editorial review, correct any remaining grammatical issues (e.g., tense of action verb), and classify and order the overall task list into two broad categories (shown below).

    - *Core Tasks*: tasks that are central to the occupation (i.e., could be expected to be performed by the majority of incumbents)
    - *Periphery Tasks:* tasks that are not central to the occupation, as well as those that are support tasks (i.e., in some occupations tasks such as supervisory and report writing activities)

Type II Editing. The main purpose of Type II editing is to provide a final review of each occupation's updated task list in order to ensure standardization, absence of redundancy, and proper classification. Once Type II editing is complete, the data are compiled into a preparatory file used in building the final database.

APPENDIX

A Primer on Preparing O*NET Occupational Task Statements

Prepared by:
J. W. Cunningham
North Carolina State University

Background: Task Statement Structure

The complete task statement includes the components shown in the figure below (Fine & Getkate, 1995). However, many of the task statements that you can expect to encounter will not contain all of these components.

BEHAVIOR (ACTION) → *OBJECT OF THE ACTION* → *PURPOSE/RESULT*

: :
: :
: :
: :

ENABLERS & CONTEXT
- Sources of information used
- Machines, tools, equipment, work aids, materials used
- Knowledge & skills drawn upon
- Methods used
- Nature of the instructions followed
- Work context or environment

Some task statements are fairly straightforward. Others are rather involved or complexly written. But if you know what components to look for, it is usually fairly easy to analyze a task statement. In the sections that follow, we shall consider each of these components separately. The examples that will be presented were taken from Fine and Getkate's (1995), The U.S. Department of Labor's (1991) *Revised Handbook for Analyzing Jobs*, the existing O*NET task statements, and some of the web task statements.

Behavior

What *action* does the worker perform on, to, or with the object? The action, or behavior, is indicated by a *verb*, which usually introduces the task statement. Ideally, it should be as concrete and specific as possible. Usually, the action will be concisely stated, as shown in the examples under *Purpose/Result*, subparagraph 1. In other cases, however, the action will be elaborated by supplementary phrases, as shown in brackets in the following examples:

-*Conducts* training sessions, … [*adapting* the material to the learning rate of the participants and the questions that they raise]….

-*Trains* youth and general assistance workers in janitorial services, [*demonstrating* operation of scrubbing machine, mixing of cleaning solutions, and how to make minor repairs….]

-*Conducts* periodic staff meetings, [*sharing* information about new policies, procedures, and resources; *answering* questions; and *discussing* project developments and problems]….

-*Develops* a course and/or seminar on human factors, including sections on safety, liability, and displays, [*dividing* it into units and *adapting* it to the requirements of the particular modality (e.g., videotapes, in-person lectures)]….

-*Reads/reviews* monthly reports sent by directors of delegate agency, [*checking* their compliance on such matters as enrollment, waiting lists….]

-*Adjusts/Aligns* grinding wheel of automated parts grinder, [*moving* spindle assembly as necessary to obtain proper tracking, *dressing* grind stone with diamond wheel for fit to grind template]….

-*Operates a crane*, [*manipulating* controls to travel forward/backward, swing, boom up/down…, *monitoring* equipment performance and adapting to changing work conditions]….

-*Manipulates/arranges* broken bones in damaged limb, [*applying* splints and wrappings]….
-*Installs* new PC equipment…, [*using* basic tools as needed; *connecting* network server, monitor keyboard,

modems, printer, and surge protector; and *introducing* related software, sometimes *setting up* a separate directory for a major application, *checking out* the installation on a test case to see if it works]….

Object

What object is affected by the behavior? This component answers the question, "*To whom or what* is the action directed?" It is the object of the action verb and is represented by a *noun* and, often, some modifying words and/or phrases. Possible kinds of objects include Things, Data, or People. Simple examples of behaviors and objects can be seen below under *Purpose/Result*, subparagraphs 1 and 2. Sometimes, however, the object will be elaborated in more detail, as shown in brackets in these examples:

-Arranges [office *furniture* such as desks, tables, and chairs]….

-Drafts [full-size or scale detail *drawings* of either autobody or chassis parts and assemblies]….

-Logs/notes on form provided [*data* relating to long distance calls (e.g., caller, party called, number], following SOP in order to….

-Calculates [advanced earned income *payments* (taxes) for qualified employees who complete form W-5], drawing on….

-Attends [*courses*, *workshops*, and other educational *activities* dealing with legal services, youth and community resources], drawing on….

-Reads/reviews [monthly *reports* sent by directors of delegate agency], checking their compliance….

-Develops [training needs *questionnaire* for distribution to agency staff using existing questionnaires], adapting them to….

-Schedules/oversees [the *preparation* of the programmatic part of a refunding proposal involving the integration of delegate agency proposals and the primary agency portion], drawing on….

-Meets/talks with [*vendors* who have contacted agency or with whom there is an ongoing relationship…], drawing on….

-Listens to [staff *complaints* about working conditions, scheduling case loads, agency performance requirements, or interpersonal conflict], examining facts….

Purpose/Result.

What is the intended *outcome* of the behavior? This component can take one of two forms:

(1) It can be <u>implicit</u> in the behavior and object, in such statements as…

-*Sells* home *appliances* to customer after pointing out saleable features of merchandise.

-*Mops*, *sweeps*, and *dusts halls* and *corridors*.

-*Copies* production *data*, using pen.

-*Explains* hunting and fishing *laws* to sporting groups.

-*Designs* custom *garments* for clients.

-*Bathes* and *gives alcohol rubs* to hospital *patients*.

-*Replenishes vending machines* with ingredients or products.

-*Cleans* and *oils parts* with soap and water, gasoline, kerosene, or carbon dioxide.

-*Develops* improved *practices* in incubation, brooding, and artificial insemination.

-*Presents subject matter* to students, using lecture, discussion, or supervised role-playing.

-*Trains* nursing staff in techniques of industrial nursing.

The verb and object in these statements indicate the action, the object of the action and, by implication, the *outcome* of the action. Thus, the following outcomes/results are implicit in the preceding examples: mopped halls and corridors, sold appliances, copied production data, garment designs, bathed hospital patients, etc. This form is a frequently used way of indicating the purpose/result—both in the existing O*NET task statements and in the ones that have come in from our Internet search.

(2) However, you also will encounter task statements in which the purpose/result is explicitly stated in a separate phrase. In these cases, the purpose/result phrase usually appears at the end of the statement and is introduced by such expressions as: "*to*…," "*in order to*…," "*that*…," "*so as to*…," "*in order that*…," etc. Fine & Getkate (1995) refer to these as ITO (in order to) phrases. Some examples are shown in brackets below:

-Tends injection molding machine [*that* molds resin pellets into plastic bottles]….

-Evaluates credit information [*to* investigate credit ratings of bank customers]….
-Conducts therapy sessions [*to* improve patient's mental and physical well-being.]

-Plans advertising campaign [*to* promote sales of merchandise.

-Prepares/lists a monthly accounts payable exception list…[*in order to* keep administrators updated on programs that are not on track.]

-Develops treatment plan [*to* meet needs of patient, based on needs assessment and objectives of therapy.]

-Helps students, individually or in groups, with lesson assignments [*to* present or reinforce learning concepts.]

-Observes and listens to engine [*to* diagnose causes of engine malfunction.]

-Crossbreeds animals with existing strains, or crosses strains [*to* obtain new combinations of desirable characteristics.]

-Negotiates with property owners and public officials [*to* secure purchase or lease of land and….]

Enablers and Context

Some of the task statements that you encounter will contain enabler and context components. An *enabler* component phrase describes how the action is "enabled" or supported so that the purpose/result can be achieved. It may include: machines, tools, equipment, work aids, etc., used; sources of information used; methods used; knowledge & skills drawn upon; and the nature and specificity of the instructions followed. Enabler phrases are usually introduced with terms such as *"using…," "referring to…," "drawing on…," "relying on…," "following…," "with..," "based on…," "according to…,"* etc. As shown in the diagram on page 1, enabler phrases almost always appear after the object of the action and may appear either before or after the ITO (purpose/results) phrase. Examples are shown in brackets in the following task statements:

-Assembles, installs, and repairs heating, water, and drainage systems, [*using* variety of machines, welding

equipment, power tools, and handtools, and *following* blueprints, specifications, and plumbing codes]….

-Adjusts/installs dies in punch presses, [*using* wrench and press gauge…, *drawing on* knowledge of punch press operation, maintenance and adjustment procedures, plant safety requirements…, and *relying on* individual discretion] in order to….

-Prepares/fills out a form for voiding checks issued that have been canceled or not fulfilled and enters data into computer, [*drawing on* information supplied by vendors or program personnel or when noted as issued incorrectly and *following* SOP] in order to….

-Reviews/backtracks the inputs that produced an apparent error on printout…, discussing matter with appropriate subordinates such as payroll clerk and program supervisor; [*drawing on* knowledge of agency organization, programs, and financial procedures; and *relying on* skill in working with people] in order to….

-Presents subject matter to students, [*using* lecture, discussion, or supervised role-playing methods.]

-Assembles machine components *according to* assembly blueprints, manuals….”

-Adjusts and repairs vending machines and meters and replaces defective mechanical and electrical parts, [*using* hand tools, soldering iron, and diagrams.]

-Observe teaching staff in classroom situations, noting teacher/assistant relationship, teacher/child interaction…, [*drawing on* observations, teaching criteria, and knowledge of child development and relying on observation and writing skills] in order to….

-Cleans and oils parts [*with* soap and water, gasoline, kerosene, or carbon dioxide.]

-Sews together sections to form mockup or sample garment or article, [*using* sewing equipment.]

-Drives forklift to move, hoist, and stack cartons of materials in warehouse, [*following* oral instructions of supervisor and written orders.]

-Folds garments for bagging and boxing, [*following* guide marks on table or using folding board.]

A *context* component phrase describes the setting or conditions under which the task is performed. Context phrases often appear at the end of the task statement or immediately following the object (but preceding the ITO phrase). Examples:

-Tends injection molding machine that…, [*working in* container department of pharmaceutical-manufacturing firm.]

-Assembles, installs, and repairs heating, water, and drainage systems, using…, [*working for* plumbing contractor specializing in new construction.]

-Evaluates credit information to…, [*working for* credit-reporting establishment.]

-Instructs students in social studies and English [*in* private, parochial junior high school.]

-Brainstorms/discusses problems affecting the entire agency [*at* retreats and general conferences convened for administrative and executive staff], asking questions….

-Observes teaching staff [*in* classroom situations], noting teacher/assistant relationship….

-Teaches one or more subjects [*in* college or university classroom.]

You will not often encounter context phrases in the task statements that you will be processing. When you do, such statements will frequently be more situation specific than would be included in a generic O*NET task statement.

Summary of the Task Statement Structure

In summary, a task statement may consist of (1) an action verb; (2) an object acted upon; (3) a purpose or desired result; (4) enablers such as information, machines, tools equipment, work aids, and methods used; and (5) context descriptions.

(1) Action verb. All task statements will begin with an action verb. By implication, the originator of the action is the worker/incumbent. Because we are dealing with occupational descriptions rather than specific positions, we have been instructed to write our statements assuming multiple incumbents as the action originators. Thus, unlike most of the task statements you have encountered in the past, our statements will start with plural action verbs. For example, "[Incumbents] Adjust and repair vending machines…."

(2) Object. Virtually all task statements will contain one or more object components referring to what gets acted upon. The object components can refer to things, data, or people.

Examples: "Install new PC equipment…"; "Calculate interest and principle payments…"; "Train youth and general assistance workers…."

(3) Purpose/result. Some tasks statements will contain an explicit purpose/result component, while others will not. Usually, in statements lacking an explicit purpose/result component, the purpose is implicit in the action and object components.

Examples: "Clean and oil parts…"; "Copy production data…"; "Sell home appliances…"

In statements that do contain explicit purpose/result components, such component phrases are usually introduced by such expressions as: "*to*…"; "*in order to*…"; "*in order that*…"; "*that*…"; etc.

Examples: "Examine works of art…, [*to determine their authenticity and value*]"; "Summarize details of transactions in…ledgers…[*to maintain records of financial transactions*…]"; "Confer with and advise parents…[*in order to develop plans for overcoming…problems in children*]"; "Observe and listen to engine [*to diagnose causes of engine malfunction*]."

(4) Enablers. Some task statements will contain enabler components. An enabler component phrase describes how the action is supported, or enabled. Such phrases are usually preceded by terms such as: "*using*…"; "*referring to*…"; "*with*…"; "*following*…"; "*drawing on*…"; "*based on*…"; "*relying on*…"; etc.

Examples: "Install and repair water and drainage systems, [*using welding equipment, power tools, and handtools, and following blueprints specifications, and plumbing codes*]"; "Present subject matter to students, [*using lecture, discussion, or supervised role playing methods*]"; "Prepare/fill out a form for voiding checks…, [*drawing on information supplied by vendors or program personnel*…]"; "Clean and oil parts [*with soap and water, gasoline, kerosene*…]."

(5) Context. You will not encounter many context component phrases. Such phrases describe the context in which the task occurs.

Examples: "Instruct students in social studies and English [*in private, parochial junior high school*]"; "Install and repair water and drainage systems…, [*working for plumbing contractor specializing in new construction*]"; "Observe teaching staff [*in classroom situations*…]"; "Brainstorm/discuss problems affecting the entire agency [*at retreats and general conferences convened for administrative staff*…]." Some context phrases, when they do occur, will be too specific for describing the broad O*NET occupations in our sample.

A General Conceptual Perspective

The Worker Function Hierarchies. For a general perspective, it might be useful for you to look at Sidney Fine's functional job analysis (FJA) framework. According to FJA, the worker can physically relate to Things, mentally relate to Data, or interpersonally relate to People (Fine, 1988). Within each of these categories, FJA posits a hierarchy of Worker Functions (WFs) benchmarked at different levels by generic action terms (functions). The Things functions include activities in which the worker interacts with machines, tools, equipment, work aids, materials, and other physical objects. The Data functions include activities in which the worker is involved with information (mostly written and symbolic), knowledge, and concepts. The People functions include activities in which the worker relates interpersonally with people. These hierarchies, as adapted by the Department of Labor (1977, 1991) in the Fourth Edition of the Dictionary of Occupational Titles, are shown below.

WORKER FUNCTION (WF) HIERARCHIES

	Things	Data	People
Lowest Level	Handling	Comparing	Taking Instructions-Helping
	Feeding-Off Bearing	Copying	Serving
	Tending	Computing	Speaking-Signaling
	Manipulating	Compiling	Persuading
	Driving-Operating	Analyzing	Diverting
	Operating-Controlling	Coordinating	Supervising
	Precision Working	Synthesizing	Instructing
	Setting-Up		Negotiating
Highest Level			Mentoring

The U.S. Department of Labor, Employment and Training Administration (ETA; 1991), has provided examples of task statements for every functional level in each of the three WF hierarchies. A copy of these statements will be placed in your NCSU mailbox. It will be useful to scan through these statements to get a feel for the range in content and level of the various tasks in the occupational domain. This list will also show you many examples of task-statement writing by professional analysts at the ETA Occupational Analysis Field Centers. Please keep in mind, however, that all of these examples do not necessarily represent the writing standard that you should follow. Moreover, it has to be taken into account that these task statements were written for occupations that were more narrowly defined than the occupations for which we are preparing statements. The examples in the list were prepared for the specific codes in the *Dictionary of Occupational Titles* (DOT; U.S. Department of Labor, 1977), which contains over 12,000 occupations, whereas the system we are working with, the Standard Occupational Classification (SOC), contains only 800 plus occupations. Accordingly, the statements that we write may, on average, tend to be somewhat more general than the examples in the list that you will receive.

Some Definitions. It might be useful to revisit the following definitions and distinctions.

- Position: "A group of tasks performed by one person" (Shartle, 1952, p. 25). A position is a "slot" within a company or other organization that is occupied by one incumbent.

- Job: **"**A group of similar positions within a single plant, business establishment, educational institution, or other organization" (Shartle, 1952, pp. 25-26). Jobs under the same title are very similar "with respect to their major or significant tasks" (U.S. Department of Labor, 1991, p. 2-1). Depending on the size of the employing organization, there are usually several to many positions under a single job title. In some instances, however, there may be only one position under a job title (e.g., Chancellor, North Carolina State University).

- Occupation: "A group of similar jobs found in several establishments" (Shartle, 1952, p. 26). An occupational title usually applies to similar jobs on a nationwide basis. It is assumed that jobs under the same occupational title share "a common set of tasks [that are] performed or are related in terms of similar objectives, methodologies, materials, products, worker actions…." (U.S. Department of Labor, 1991, p. 2-1). Examples can be found among the occupations defined in the *DOT* (which has been replaced by the *Occupational Information Network*, or O*NET).

- Occupational Cluster: A group of occupations with similar human requirements. An occupational cluster may be narrowly defined, containing only a few occupations involving similar duties, tasks, and training; or it may be more broadly defined, containing a relatively large number of occupations that are similar only in their requirements for more general abilities and skills.

For the most part, the O*NET/SOC occupations are actually rather narrowly defined or constricted occupational clusters; most of them subsume multiple DOT occupational titles. However, the O*NET occupations are considered specific enough to be described by representative task statements. You will be writing those task statements.

General Guidelines for Writing Task Statements

Because of breadth of most O*NET occupations, not many task statements will apply to every single position (incumbent) and job in a given occupation. Rather, the task statements should be viewed as representatives or exemplars of the kinds of activities that the occupation's incumbents perform. Some task statements will be generic enough to apply to the majority of incumbents in an occupation, whereas other statements will apply to substantially less than the majority. Thus, for example, some of the "may" statements (task statements beginning with the word "May") will survive the editing process and be included in the final occupational descriptions (although we will delete the word "may" from these statements).

Task writing requires considerable individual judgment. It is an art, and no two writers will produce exactly the same results. It is essential, however, that the writers follow common guidelines in order to maintain some uniformity in task-statement structure.

First, please refer back to the description of the task-statement structure, starting on Page 1. The major components of a task statement, in their typical order of occurrence, consist of:

Action verb → Object of the action → Purpose or Result of the action

You should write your task statements within that general framework, according to the guidelines and examples presented below.

Action Verb. Always start the statement with an action verb in the present plural form; that is, the verb should agree with an implicit plural subject, or originator of the action (multiple incumbents). Example: "*Assign* guard force personnel to station or patrols." Sometimes a task statement will contain more than one action verb, if those actions are closely linked or directed toward a common purpose. Examples: "*Confer with and advise* parents, teachers, and children in order to…."; "*Adjust and repair* vending machines and meters…."; "*Supervise and coordinate* activities of workers…"; "*Mop, sweep, and dust* halls and corridors"; "*Select, install, and adjust* saw blades, cutter heads…."; "*Examine* food service records and *taste* food and beverage samples to determine…." Occasionally, the action verb will be elaborated by a subsequent phrase containing more detailed verbal modifiers. Examples: "Shape knitted garments after cleaning [by *shrinking or stretching* garments by hand] to conform to…."; "Manipulate/arrange broken bones in damaged limb, [*applying* splints and wrappings….]"; "Check equipment…for state of usefulness and need for additional equipment, [*completing* purchase requisitions when necessary….]"; "Offer articles at auction, [*asking* for bids, *attempting* to stimulate buying desire of bidders, and *closing* sales to highest bidder]." (Other examples of action components can be seen in previous sections under that title.)

Object. The action verb should be followed by a noun indicating the object of the action (in the form of things, people, or data). Often there will be more than one object of the action, as shown in some of the immediately preceding examples (see Action Verb, above, as well as previous sections on the object component). Other examples: "Type *letters, reports, stencils, forms and other straight copy material*…."; "Select and position, align, and secure *electrodes, jigs, holding fixtures, guides, and stops*…."; "Operate *throttle, air brakes, and other controls*…." In addition, there will often be elaborating information accompanying the object noun, in the form of modifying adjectives and phrases. Examples: "Meet with representatives [*of entertainment attractions, such as troupes, performers, or motion picture distributors*], to arrange terms…."; "Develop a course and/or seminar [*on human factors, including sections on safety, liability, and displays*]…."; "Meet/talk with vendors [*who have contacted agency or with whom there is an ongoing relationship*]…."; "Assay mineral samples [*taken from outcrops, floats, and stream channels*]…."; "Counsel and aid individuals and families [*requiring assistance of social service agency*]." (Other examples of object components were offered in previous sections under that title.)

Purpose/result. If there is an explicit purpose/result component, it will usually follow the object component. Where possible, it is desirable to include an explicit purpose/result component, unless the purpose is apparent in the action and object components. However, unless you are reasonably confident as to the appropriate wording of a purpose phrase, do not try to create one from thin air if the existing task statements contain no words from which to construct it. Purpose/result phrases will often be introduced with the preposition "to" (preferred over "in order to"), although other introductory terms may be appropriate as well, such as "that," "in order that," and "for" (depending on the discretion of the writer). Examples: "Plan and arrange for activities of radio or television studio and control

room [to ensure technical quality of pictures and sound for programs originating in…]"; "Test ballpoint pen cartridges [to determine conformity to company specifications….]"; "Contact individuals and firms by telephone and in person [to solicit funds for charitable organizations…]." (For other examples, see previous sections on the purpose/result component.)

Enablers. As mentioned, some task statements include enabler components in the form of phrases containing such information as: machines, tools, equipment, and work aids used; methods used; sources of information used; and knowledge and skills drawn upon. Typically, these phrases are introduced by such terms as "using," "following," "relying on," "drawing on," "according to," etc. Examples: "Select and secure tool in spindle, [using wrenches]"; "Repair and maintain production machinery [in accordance with blueprints, diagrams, and operation manuals, using handtools, power tools, and….]"; "Create musical compositions, [using knowledge of harmonic, rhythmic, melodic, and tonal structure and other elements of music theory]"; "Prepare specialty food, such as…, [according to recipe using specific methods applicable to type of cookery]." (More extensive examples of enabler phrases can be seen in previous sections under that title.) Enabler phrases almost always appear after the object of the action but may appear either before or after the purpose/result component. In the hard-copy examples you were given, the enablers usually appear after the purpose component; but that can sometimes produce an unwieldy statement. The writer should use his/her best judgment in locating the enabler phrase. Occasionally, you will encounter a statement that refers entirely to enablers, such as equipment or information used. Example: "Use a variety of specialized equipment such as electron microscopes, gas and high-performance liquid chromatographs, electrophoresis units, thermocyclers…." Such statements are directed more toward knowledge and capabilities required than results accomplished. It has been decided, however, that a limited number of such statements (perhaps one or two) is acceptable in an occupational description.

Context. Occasionally, you will encounter phrases describing the context in which the task occurs. Such phrases usually are introduced by prepositions such as "in," "at," "for," or "of." Context phrases, when they occur, often appear at the end of the task statement, but may appear in other locations as well (e.g., following the object component). Examples: "Train wild animals, such as…, to perform tricks for entertainment of audiences [at circuses or other exhibitions]"; "Drive forklift to move, hoist, and stack cartons of materials [in a warehouse], following oral instructions…."; "Plan and establish collection routes and direct assignment of personnel and equipment [in operation of a municipal sanitation department]"; "Examine food service records and taste food and beverage samples to determine sales appeal and cost…[in food establishments]". (More extensive examples of context phrases can be seen in previous sections under that title.) A context phrase can limit a task statement's generalizability. Before including one in a task statement, consider whether it will reduce the statement's range of applicability within its occupation. If that is the case, it might be best to omit it, unless it is important to the reader's understanding of the task.

Writing Task Statements for Web-Task Clusters

Following are some pointers for preparing task statements for web-task clusters:

(1) Look for common content in the major components of a cluster's web-task statements—the action, object, and purpose components. If these components appear similar, then look for commonalities and differences in any enabler phrases that may be included in the statements. If the major components are similar within a cluster, but there are some differences in the enablers, the various enablers might be represented in a generic task statement with a "such as" phrase. Examples: "…using *such* tools *as* wrenches, pliers, screwdrivers, saws, and drills"; "…using a variety of specialized equipment *such as* electron microscopes, gas and high-performance liquid chromatographs, electrophoresis units…." In addition, "such as" phrases can be used when necessary in a generic task's object component. Examples: "Meet with representatives of entertainment attractions, [*such as* troupes, performers, or motion picture distributors….]"; "Examine works of art, [*such as* paintings, sculpture, and antiques….]"; "Collect, classify, and record forest data, [*such as* rainfall, stream flow, and soil moisture…]." The "such as" phrase could also be used in the occasional context component of a generic task statement. Rarely, however, should the "such as" phrase be used in the action and purpose/result components.

(2) Decide whether you think one statement can be written to represent the entire cluster, or whether more than one statement will be required. In some instances, one statement may cover the majority of the tasks, but additional statements may be needed for the remaining ones. If necessary, it is acceptable to subdivide a cluster into subgroups and write a separate statement for each subgroup, or to write separate statements for some individual tasks. In some infrequent cases, a task that does not seem to go with any of the others in a cluster, and which does not contain sufficient information to stand alone, may be ignored—unless that task is an isolate (the only task in the "cluster"), in which case the program requires that it be represented by a separate statement. If you find it particularly difficult to formulate a generic task statement representing an entire cluster, this is probably an indication that you should write more than one task statement for that cluster.

(3) Apropos the last point in item 2, it is best to avoid constructing overly complex, compound task statements involving multiple action and purpose components. This issue requires some judgment as to the appropriate balance between the desirability for generic statements applicable to task clusters, on the one hand, and the confusion and unwieldiness inherent in overly complex statements, on the other. As shown in some of the previous examples, it is often appropriate to combine actions that are closely linked in time and purpose, and to combine purposes that are closely related. Examples of appropriately combined actions: "*Mop, sweep, and dust* halls and corridors"; "*Collect, classify, and record* forest data…."; "*Plan, direct, and coordinate activities* of designated project to ensure…." Examples of appropriately combined purposes: "Confer with and advise parents…[in order to *develop plans for overcoming behavioral, personality, or scholastic problems in children*]"; "Negotiate with property owners and…, [*to secure purchase or lease of land and right-of-way for utility lines, pipelines, and other construction projects*]"; "Brainstorm/discuss problems affecting entire agency…[*in order to establish priorities, explore feasible solutions, and develop team approaches*]"; "Conduct/facilitate group sessions…[*in order to break down denial, build self-esteem, and practice new behaviors in a safe environment*]"; "Operate crane, manipulating controls…, [*in order to hoist material, erect steel, or pour concrete*]." Multiple objects and multiple enablers present less of a problem and occur frequently in task statements. The best advice regarding this issue is: If uncertain, split the statement. However, avoid creating multiple statements containing repetitive wording. If you find yourself doing that, then you should probably consider merging some of those statements.

(4) In writing a new task statement, rely heavily on the words that are already contained in the cluster's constituent task statements; that is, try to construct the generic statement with words taken from the cluster's existing web-task statements. It is quite appropriate to add new words as needed that are not technologically or content-related, such as conjunctions, prepositions, articles, pronouns, and most adjectives and adverbs; but exercise caution in adopting new words that are more likely to be related to the technical aspects of the occupation, such as verbs and nouns. This is only a caution and not an iron-glad rule; but you should be confident that any new technical terms you adopt are valid ones.

(5) Remember to begin the new task statement with an action verb in the present plural form, as described previously under *General Guidelines for Writing Task Statements.* Examples: "*Assign* [not *Assigns*] guard force

personnel to station or patrols"; "*Confer* with and *advise* [not *Confers* with and *advises*] parents, teachers, and children in order to…."

(6) Some Web-task "clusters" will consist of only one task statement, hereafter referred to as an "isolate." It is appropriate to revise an isolate to bring it into closer conformity with the recommended task structure; but as indicated in item 4 above, be cautious in adding information that is not already there, particularly information of a technical nature. If the isolate statement contains incomplete information, there is probably little you can do to improve it. As mentioned, however, the program requires that you enter a statement for every cluster, and because the isolate statement is the only member of its cluster, it will have to be entered into the system in some form. In the subsequent editing stage, such statements either will be eliminated or supplemented with additional information.

(7) Some clusters will contain what might be referred to as "support tasks," involving activities that are somewhat peripheral to the occupation's core content and mission. In some occupations these might include, for example, supervisory and report writing activities. Such tasks are good candidates for merger into broad, generic statements (e.g., one statement each for supervision and report writing), unless they involve distinctly different purposes.

(8) Because this project's approach to task-statement generation has never been attempted before, no good examples of generic task statements for clusters can be offered. Presented below, however, are some cluster-based statements taken from a prototype description for the O*NET occupation, Microbiologists. These statements were generated before the project's clustering phase began, and they have not been reviewed or edited. They are intended merely as illustrations of how cluster statements might be generated, and should not be viewed as reflective of standards to be followed.

Microbiologists

New task statement: Examine physiological, morphological, and cultural characteristics, using microscope, to identify and classify microorganisms.

Cluster members:
-Examines physiological, morphological, and cultural characteristics, using microscope, to identify micro-organisms.
-Observes, identifies, and classifies micro-organisms.

New task statement: Conduct analyses of nucleic acids, proteins, enzymes, and other substances produced by microorganisms.

Cluster members:
- Conducts chemical analyses of substances such as acids, alcohols, and enzymes.
- Analyzes nucleic acids, proteins, and other substances produced by micro-organisms.

New task statement: Investigate the growth, structure, function, and other characteristics of microorganisms such as viruses, bacteria, protozoa, fungi, and algae.

Cluster members:
- Studies growth, structure, and development of viruses and rickettsiae.
- Studies growth, structure, development, and general characteristics of bacteria and other micro-organisms.
- Studies the growth, characteristics, and effects of bacteria and other micro-organisms to better understand their relation to human, plant, and animal health."
- Conducts research into the structure and functioning of human, animal and plant tissues and cells.
- Investigates the growth and characteristics of microscopic organisms such as bacteria, algae, or fungi.
- Conducts research into the structure, function, ecology, biotechnology and genetics of micro-organisms, including bacteria, fungi, protozoans, and algae.

New task statement: Conduct microbiological research and development aimed at the production of food, nutrients, pharmaceuticals, vitamins, polymers, pollution-control agents, laboratory materials, and other products.

Cluster members:
- Researches use of bacteria and micro-organisms to develop vitamins, antibiotics, amino acids, grain alcohol, sugars, and polymers.
- Develops new products and the monitors established processes for microbial content.
- Develops modified microbes for use in the production of specialty biologicals or for gene transfer.
- (may) tend strains of microorganisms which produce alternate sources of energy.
- (may) help set quality standards for products.
- Conducts clinical or laboratory studies to test, evaluate and screen drugs and pharmaceuticals.
- Develops and teaches new methods of preservation for food and pharmaceutical supplies.
- Isolates micro-organisms involved in breaking down pollutants.

New task statement: Use a variety of specialized equipment such as electron microscopes, gas and high-pressure liquid chromatographs, electrophoresis units, thermocyclers, fluorescence activated cell sorters, phosphoimagers, and computers.

Cluster members:
- Uses a variety of specialized equipment such as gas chromatographs and high pressure liquid chromatographs, electrophoresis units, thermocyclers, fluorescence activiated cell sorters and phosphoimagers.
- Uses electron microscopes and other complex laboratory equipment.
- (may) use computers in conducting experiments.

New task statement: Supervise and train biological technologists and other personnel.

Cluster members:
- (may) supervise biological technologists and technicians and other scientists.
- (may) train and supervise other personnel, keep records, and prepare reports.

**_Note_ that "may" has been deleted from the new task statement.

New task statement: Conduct studies aimed at understanding and controlling factors involved in the spread of communicable diseases.

Cluster members:
- Tries to control the spread of infectious agents by insects, rodents, and wildlife.
- Focuses on the control of communicable diseases and other health hazards in the community.
- Conducts studies into the identification, effects and control of human, plant and animal pathogens and toxins.
- (may) investigate how organisms cause disease and their role in disease processes.
- (may) investigate what factors contribute to the occurrence of disease in a population and how epidemics can be controlled.

New task statement: Perform tests on water, food, specimens from patients, and the environment to detect harmful microorganisms and chemicals and control sources of contamination and pollution.

Cluster members:
- Performs tests on water, food and the environment to detect harmful micro-organisms and control sources of pollution and contamination..
- Tests water in lakes and streams for biological and chemical pollutants and inspects food and water in processing plants.
- (may) isolate and identify microorganisms in specimens from patients as well as from water supplies, food, and milk.

New task statement: Conduct molecular or biochemical studies and experiments into genetic expression, gene manipulation, and recombinant DNA technology."

Cluster member:
- Conducts molecular or biochemical studies and experiments into genetic expression, gene manipulation, and

recombinant DNA technology.

New task statement: Provide consulting support to various organizations on technical matters related to microbiology.

Cluster member:
- (may) serve as consultant on diagnosis and technical problems.

New task statement: Perform laboratory tests to provide health departments, clinics, and physicians with information needed for diagnosis and treatment.

Cluster members:
- Provides laboratory services for local health departments and community environmental health programs.
- Performs laboratory tests to provide physicians with information needed for diagnosis and treatment.

New task statement: Investigate the nutritional role played by microorganisms in cattle, sheep, poultry, and other livestock.

Cluster member:
- Investigates the nutritional role played by microorganisms found in cattle, sheep, and other ruminants.

New task statement: Develop uses of microorganisms to control insects, combat plant disease, and increase crop yield.

Cluster members:
- Focuses on methods to combat crop damage and increase crop yield.
- Works with the effect of microorganisms on soil and agricultural products and the use of microorganisms as agents of insect control.

Revising Existing O*NET Tasks

In the earlier matching stage of this project, web (W) task statements were assigned to existing O*NET (O) task statements when they were conceptually similar to the O-tasks and contained additional information that might improve the O-task statements. In this stage of the project, you will be revising O-task statements by incorporating into them useful information from their assigned W tasks. Following are some general guidelines for O-task revision.

(1) First, review all previous sections of this primer, with the exception of Items 2, 6, and 8 under Writing Task Statements for Web-Task Clusters, which pertain exclusively to the generation of new task statements and are not applicable to O-task revision. For example, unlike the previous writing assignment involving W-task clusters, in O-task revision you will not have the option of writing more than one statement for each task set (i.e., an O task and its assigned W tasks), nor will you be dealing with isolate statements. However, please do review Items 1, 3, 4, 5, and 7 in that section, which contain information that can be selectively generalized to O-task revision. With the exceptions just noted, all previous information and guidelines in the primer are applicable to O-task revision.

(2) Every O-task statement that you will be considering will have at least one and often several W-task statements assigned to it. Regardless of the number of W tasks assigned to an O task, consider the O-task statement as the central or core statement in the task set and its assigned W tasks as potential supplements to that core. Thus, your assignment is to review the information in the W-task statements to determine whether they contain additional information that would improve the O-task statement. If so, then revise the O-task statement, incorporating the additional information into it. (However, see Item 9 below regarding occasional exceptions.)

(3) In revising an O-task statement, rely as heavily as possible on words that are already contained in that O task and its assigned W tasks. It is appropriate to use new words as needed, but avoid adopting new terms of a technical nature unless you are confident that they are valid within that particular context. For more detailed instructions on this point, please see Item 4 in the preceding section, Writing Task Statements for Web-Task Clusters.

(4) Try to avoid constructing overly complex, compound task statements involving multiple action and purpose components. As mentioned earlier, appropriate balance in regard to the detail, generalizability, and readability of a task statement is a matter of judgment. It is sometimes appropriate to combine actions that are closely linked in time and purpose, and to combine purposes that are closely related. Multiple objects and enablers occur even more frequently in task statements and present less of a problem. However, statements that run on and on and contain a lot of “ands” can be unwieldy and confusing. As a general rule, you should avoid creating statements of more than 30 words; but as with some previous rules, you will occasionally encounter situations that justify exceptions. Please see Item 3 under Writing Task Statements for Web-Task Clusters for more detail regarding compound statements.

(5) Try to avoid adding information to the O-task statement that will significantly narrow the task’s generalizability within its occupation, unless that additional information is needed to clarify the statement and make it more understandable. One way to add detail without narrowing the scope of the O-task statement—particularly in the case of added objects, enablers, and the occasional context component—is to use “such as” phrases. Please see Item 1 under Writing Task Statements for Web-Task Clusters for more detail on the use of “such as” phrases.

(6) Apropos Items 4 and 5 above, do not feel compelled when revising an O-task statement to use every bit of additional information contained in its assigned W tasks. An item of information may be ignored if, in your judgment, it would not contribute significantly to the O task or if its inclusion would add noise and confusion to the O-task statement, unnecessarily narrow the scope of the statement, or produce an overly long, complex, and unwieldy statement.

(7) As mentioned, the action verb(s) should be in the present plural form (see Item 5 in the preceding section and “Action Verb” under General Guidelines for Writing Task Statements). Examples: “Develop [not Develops] a course and/or seminar on human factors…”; “Adjust and repair [not Adjusts and repairs] vending machines and meters….” All of the existing O tasks begin with an action verb in the singular form. Accordingly, it will be necessary for you to change the action verb(s) in every revised O task to the plural form.

(8) If, in your judgment, an O-task's assigned W tasks contain no additional information that would improve the O-task statement, and if the O-task statement is already well written, then do not feel compelled to revise that statement. If you exercise that option, however, the revision program requires that you reenter the unrevised O-task statement into the system; that is, you do not have the option of entering nothing into the system. But before entering the O task, do not forget to change the action verb(s) to the plural form.

(9) Finally, most of the preceding items are simply rules of thumb and may be overridden if necessary. For example, Item 2 notwithstanding, there will likely be some occasions when the O-task statement is clearly inadequate in relation to one or more of its assigned W tasks. In such instances, you may decide to adopt a W task statement as the core statement, make any needed revisions in it, and enter it into the system in place of the O task. As mentioned, task writing is an art requiring individual judgment. Nevertheless, these guidelines are important in establishing some uniformity in the way the task statements are structured and written.

References

Fine, S.A. (1988). Functional job analysis. In S. Gael (Ed.), The job analysis handbook for business, industry, and government (pp. 1019-1035). New York: Wiley.

Fine, S.A., & Getkate, M. (1995). Benchmark tasks for job analysis: A guide for Functional job analysis (FJA) scales. Mahwah, NJ: Lawrence Erlbaum.

Shartle, C.A. (1952). Occupational information: Its development and application (2nd Ed.). New York: Prentice Hall.

U.S. Department of Labor. (1977). Dictionary of occupational titles (4th ed.). Washington, DC: U.S. Government Printing Office.

U.S. Department of Labor, Employment and Training Administration. (1991). The Revised handbook for analyzing jobs. Washington, DC: U.S. Government Printing Office.