Research Article

# The Role of Occupational Research in Complex Assessments: Aligning Educational Practices with Workplace Requirements

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**Structured Abstract**

- **Background**: The perspectives of the employer community—as a stakeholder in educational outcomes for the 21st century workforce—raise important practical and theoretical questions. The seeming disconnect between academic preparation and workforce performance suggests the need to find a common vocabulary—one that is grounded in research and builds on previous public efforts to meet the needs of the emerging workforce. Exploring the realm of field research that has resulted in the U.S. Department of Labor's Occupational Information Network (O*NET), in this article I examine the ways in which learning theory and research in skill applications have advanced our understanding of the role of competency frameworks and assessment in career readiness and workforce development. Special attention is given to the importance of context in examining questions of learning transfer from the classroom to the workplace. The role of metacognition as a higher-order thinking skill and its relationship to collaborative problem-solving will be explored as a potential learning strategy. Looking at the role that assessment can play in a promising job simulation prototype, I conclude by exploring a Workplace English Communication (WEC) initiative called Kitchen Design (KD)—a digitally delivered simulation involving complex tasks that is a topic of this special issue. In sum, this study synthesizes findings from research and field studies to suggest areas of further exploration in research-to-practice collaboration across disciplines.

- **Questions Addressed**: This study is an exposition of research related to the role of occupational research in assessing complex communication skills. I have designed the exposition to answer five questions:
    1. How can educators better ensure the transfer of skills from the classroom to other domains?
    2. In what ways do competencies contribute as measurable constructs in addition to skills?
    3. Can collaborative problem-solving serve as an effective metacognitive strategy?
    4. How does the alignment between academic skills and job requirements highlight the importance of situated learning?
    5. Can job simulations that combine learning and assessment play a role in the transfer of learning to different domains?
- **Conclusions**: To meet the needs of students entering the 21st century workforce, educators and researchers can play a critical role in advancing the need for innovative, complex assessments, and learning strategies. In both cases, occupational research and the use of tools like O*NET provide a foundation for facilitating the transfer of learning where metacognition and collaboration strengthen the development of competencies in the world of work. In addition, the use of job simulations in technology such as the KD prototype can introduce students to the demands of jobs that reflect the complexity of skills used in concert and in context. Formative assessment in such situated learning simulations and in blended-learning settings can enhance the abilities of students to apply their skills to new situations and across domains in areas such as writing, reading, and mathematics.

*Keywords*: assessment**,** metacognition**,** O*NET**,** SCANS**,** situated/contextual learning**,** Texas Workforce Commission's Standards 2.0, transfer, Workplace English Communication, writing analytics

## 1.0 Introduction

Educators, employers, and researchers have a mutual goal of preparing students to succeed in meaningful work. However, there has not always been a consensus as to the best way to achieve this objective. A 2020 report from the U.S. Chamber of Commerce Foundation, *Hiring in the Modern Talent Marketplace*, points to what may be a common approach to preparing learners for the workplace. The report addresses how companies can best identify candidates who are the

"right fit" for their organizational needs and culture. What are the most important considerations in hiring when almost three-quarters of organizations report that there is a lack of talent with desired skills? A primary insight is that employers are looking at *competencies*—not degrees or educational credentials—as the most indicative factor when considering candidates.

The survey by the U.S. Chamber of Commerce Foundation underscores that this shift to competencies instead of degrees would constitute a major evolution in hiring practices. The report also underscores that, to align with employer needs and prepare students for success in the workplace, educational practices should be better aligned with the needs of U.S. employers: higher education institutions should focus on competencies and skills. The employers surveyed "reported that competency is more important to their organizations than a formal education when evaluating a potential candidate" (U.S. Chamber of Commerce Foundation, 2020, p. 9).

Based on my experience as a teacher, federal policymaker, and consultant, I have long been interested in the question of how we can better prepare students for the demands of the workplace as well as to be responsible, fulfilled individuals. As Director of Adult Education at the U.S. Department of Education (DoE) from 1986 to 1988 and since then, I have considered adult literacy as an area in which researchers have made valuable contributions in their studies of transferable skills and the role of contextual learning.

Reflecting on my earlier experiences, in this article I connect the current disjuncture that employers see between academic attainment and the demands of the modern workplace to illuminating research that highlights the need for common vocabulary and assessment strategies around competencies and transferable skills. Following this introduction in Section 1.0, in Section 2.0, I identify the five research questions that drove this study; in Section 3.0, I introduce competency assessment as a measurement challenge, with special attention to the U.S Department of Labor (DoL) Secretary's Commission on Achieving Necessary Skills (SCANS) and questions raised by this federal initiative (U.S. Department of Labor, 1993). In Section 4.0, I introduce the Texas Workforce Commission's Standards 2.0 project and feature the U.S. DoL Occupational Information Network (O*NET) that aligns academic standards with workplace competencies and skills. Section 5.0 narrows the focus on competency assessment to the Workplace English Communication (WEC) Kitchen Design (KD) project in which I participated for two years. Section 6.0, the conclusion to the study, provides answers to the research questions.

## 2.0 Research Questions

The five questions that drove my study of workplace competencies are as follows:

1. How can educators better ensure the transfer of skills from the classroom to other domains?
2. In what ways do competencies contribute as measurable constructs in addition to skills?
3. Can collaborative problem-solving serve as an effective metacognitive strategy?

4. How does the alignment between academic skills and job requirements highlight the importance of situated learning?
5. Can job simulations that combine learning and assessment play a role in the transfer of learning to different domains?

These questions assume greater relevance in writing, for instance, when one looks at the SCANS research alluded to above and to the O*NET tools now available to instructors. In the case of the former, one of the SCANS reports—*Learning a Living: A Blueprint for High Performance* (U.S. Department of Labor, 1992a)—provides a comparison between how writing is taught and what the workplace requires, as shown in Table 1.

**Table 1**

*Writing Instruction and Workplace Demands*

| What today's schools teach | What the workplace requires |
|---|---|
| **Purposes for writing** | |
| Central purpose: to display mastery of knowledge, skills, and format | Range of purposes (instrumental): to inform, persuade, clarify (or obscure), soften the blow, explain how to do something, make a recommendation, sell |
| **Types of writing routinely generated** | |
| Essays, book reports, poetry, stories, research papers, letters | Reports, brochures, letters, memos, proposals, surveys, ad copy, instructions, planning documents, messages, specifications, recommendations, logs, legal documents/contracts, news releases, minutes, personnel evaluations |

*Note.* From *Learning a Living: A Blueprint for High Performance* (U.S. Department of Labor, 1992a, p. 43).

Looking at writing as a profession, the O*NET profile of a technical writer provides insight into how writers must deploy a variety of skills, knowledge, abilities, and work styles in concert and in context as they perform specific tasks or "detailed work activities," including the following:

- Edit written materials.
- Compile technical information or documentation.
- Maintain records, documents, or other files.
- Determine presentation subjects or content.
- Research new technologies.
- Write informational material.
- Review details of technical drawings or specifications.
- Coordinate logistics for productions or events.
- Design layouts for print publications.

- Monitor current trends.
- Draw detailed or technical illustrations.
- Confer with clients to determine needs.

As both the SCANS research and the O*NET profile make clear, it is not enough to focus simply on skills—in instruction or assessment:

> High-performance workplaces also require the ability to manage resources, to work amicably and productively with others, to acquire and use information, to understand and master complex systems, and to work with a variety of technologies. We called these the 'competencies.' (U.S. Department of Labor, 1992a, p. 6)

## 3.0 Competency Assessment as a Measurement Challenge

Competencies in the 2020 U.S. Chamber of Commerce Foundation report are defined as "abilities, attitudes, knowledge, skills, tasks, and tools or technologies associated with some task which can be observed, measured, or otherwise assessed" (p. 9). For those working in the field of workforce development, this is not the first time that the critical role of competencies has been defined in contextual terms—that is, in terms of how skills, abilities, knowledge, and attitudes are applied to complete real-world tasks.

### 3.1 Secretary's Commission for Achieving Necessary Skills

In 1990, the U.S. DoL established the Secretary's Commission on Achieving Necessary Skills (SCANS) to document the competencies and skills that lead to success at work (U.S. Department of Labor, 1993). Commission members included 31 representatives from the nation's schools, businesses, unions, and government. The Commission issued its first report, *What Work Requires of Schools*, in June 1991. Although the Commission completed its work in 1992, its findings and recommendations continue to be a valuable resource for individuals, employers, instructors, and policymakers involved in education and workforce development. If at least one goal of education is workforce preparation/career readiness, then the SCANS articulation of work requirements in competency-based language helps build a bridge between employers and educators (see Appendix A for a description of the SCANS skills).

In the late 1980s, during my tenure at the U.S. DoE, I was in a unique position to observe the formation of the SCANS while working with the Employment and Training Administration (ETA) at the U.S. DoL. With the support of the ETA's Assistant Secretary, Roberts T. Jones, we undertook a number of joint initiatives to articulate more clearly "what work requires of schools" (the subtitle of the initial SCANS report)—or in my case, adult education programs. In one initiative, we collaborated via an interagency technology transfer project to produce a civilian version of the U.S. Army's Job Skills Education Program (JSEP; Dick & Branson, 1990). The underlying military research for the development of this program found that enlisted

personnel who learned from job-related materials were able to transfer the skills learned to job-reading tasks more readily than soldiers who attended general literacy classes (Mikulecky et al., 1994). Potential reasons for this ease of transfer are discussed below related to contextual learning.

### 3.2 Emphasis on Workplace Literacy

The SCANS was aligned with a series of projects that all pointed in the same direction. From the U.S. DoE's perspective, the partnership with the DoL underscored the need for a policy and programmatic emphasis on *workplace literacy*. That meant, among other things, that instructors needed to incorporate contextual approaches to literacy to provide meaningful curricular offerings that resulted in their students mastering transferable skills. At the time of the SCANS report, for instance, there was cognitive psychology research that highlighted the contribution of higher-order thinking skills in a transformative educational practice termed "situated learning." In *The Double Helix of Education and the Economy*, Berryman and Bailey (1992) stated that

> The learning environment should reproduce the technological, social, chronological and motivational characteristics of real-world situations. This means situated or contextualized learning (i.e., real tasks like using reading and writing in an electronic message system to communicate questions and advice). (as cited in Mikulecky et al., 1994, p. 19)

The follow-on SCANS publication, *Skills and Tasks for Jobs* (U.S. Department of Labor, 1992b), provides examples for educators on how skills are embedded in the SCANS competencies across 50 occupations. In the case of writing, for example, Table 2 illustrates three occupations and related real-world skill applications that instructors can use in the classroom.

**Table 2**

*SCANS Occupations Aligned with Writing Tasks*

| Occupation | Task (Writing) | Task details (adapted) |
|---|---|---|
| Medical Technologist | Use the computer to write a report of lab results for use by the appropriate physician. | Enter a preliminary report into the computer for interpretation by requesting doctor highlighting the results of laboratory culture test and including a detailed description of how the organism of interest was identified. |
| Computer Operator | Write computer operations procedures and memos to request changes to ensure all functions operate properly. | Read and review previous documentation to computer operations procedure; outline a draft of recommended procedure; request assistance from other operators to proof draft and provide revisions; write procedure in final form and submit to supervisors for approval. |
| Quality Inspector | Write investigation reports. | Gather employee interview statements about an accident or situation being investigated and conduct physical investigation, including measurements and other means to see if safety laws have been violated; then write a report of what was done during the inspection, persons interviewed, the determination, and whether any standards were violated. |

Consequently, the SCANS research provides insights into the important difference between how skills are assessed in the classroom and how they are applied at work. In a classroom or instructional setting, generally one skill (e.g., reading or math) is taught and measured at a time.

With the emphasis on standardized testing and "teaching to the test," many educators and researchers have advocated moving to more authentic ways of assessing student learning and improving the teaching of "higher-order skills." In *Beyond the Bubble Test*, Darling-Hammond and Adamson (2014), for instance, make the case for assessing higher-order skills such as problem-solving, analyzing, and synthesizing information and the use of performance assessments to improve teaching and learning, including engaging students as active participants in ways that simulate the skills they will need across the curriculum and beyond the school doors.

Concurrent psychological analyses conducted at the time of SCANS questioned the transfer of generalizable "context-independent" skills. One such study synthesizing 20 years of transfer studies concluded that the case for such skills "has proven to be more a matter of wishful thinking than hard empirical evidence" (Perkins & Salomon, 1988, p. 19). To underscore the importance of being able to transfer skills learned in academic settings, it is critical to understand that in the workplace, employees use a *combination* of knowledge, skills, attitudes**,** and abilities—or competencies—to successfully perform an activity. To explain, I reference the work

of educational psychologists' identification of "high-road" and "low-road" transfer where metacognition plays a critical role (Mikulecky et al., 1994):

> Low-road transfer refers to developing some knowledge/skill to a high level of automaticity. It usually requires a great deal of practice in varying settings. Shoe tying, keyboarding, steering a car, and single-digit arithmetic facts are examples of areas in which such automaticity can be achieved and is quite useful.
>
> High-road transfer involves: cognitive understanding; purposeful and conscious analysis; mindfulness; and application of strategies that cut across disciplines. In high-road transfer, there is deliberate mindful abstraction of an idea that can transfer, and then conscious and deliberate application of the idea when faced by a problem where the idea may be useful. (*Learning Theories and Transfer of Learning*).

In workplace literacy, a policy focus for both adult educators and literacy researchers, evaluations of general-literacy versus job-related instruction followed the research of Tom Sticht (1982).

> Metacognitive aspects of literacy did consistently and significantly correlate to job performance. Top job performers, be they supervisors, experienced technicians, or trainees, were better able to identify key concepts, summarize key ideas, and provide details related to these key concepts. They were independent and able to operate on their own. Though they did use references and did need to look up information to teach themselves about new tasks, they were more efficient and spent less time at such reading and needed to spend less time listening to others giving them directions. (Mikulecky & Ehlinger, 1986, p. 60)

This notion refers to Salomon's "high-road transfer" based on the use of skills in concert and in context.

To facilitate skill transfer, postsecondary educators in general education have developed an assessment of "performance" tasks, which are plausible scenario-based real-life situations in which action is required and students play roles that require making and justifying a decision or recommendation in writing, orally, or through a combination of written and oral forms. (Hawthorne et al., 2018, p. 68). Seen from the perspective of adult educators, performance assessment tasks "tend to be more cognitively demanding, educationally relevant, and authentic to real-life situations, which means that they are not usually designed to focus either on small increments or the component skills and abilities that may contribute to successful performance on the task as a whole" (National Research Council, 2002, p. 65).

In the comparison of general (classroom-based) versus job-related instruction, in an academic context, skills are taught to individuals. In the workplace, the context for applying skills often requires collaboration and working in teams to solve problems collaboratively. Educators

challenged with engaging students in general education classes (as cited above) have found the "performance task" approach to be a powerful pedagogical strategy: The tasks "provide students (working individually or in groups) with hands-on practice applying course concepts to solve realistic problems" (Hawthorne et al., 2018, p. 68). While there is no direct connection between student performance and course grade, "motivation for high-quality work must come from the task itself: scenario relevance, role believability, and clear applicability to the students' lived experience become critical for drawing students into the work" (Hawthorne et al., 2018, p. 68).

The social aspect associated with the transfer of communication skills was ascertained via a longitudinal study where students were able to transfer "rhetorical skills and genre knowledge" from a college communications classroom to the workplace. Emphasizing the importance of social engagement for transfer of knowledge, Schieber (2016) identifies the importance of three factors that facilitate the transfer of learning: knowledge of how a community of practice works, participants' self-identity, and gradual fuller participation within the community. She also found, however, that

> participants who did not have access to that knowledge, did not identify with the new community, and were not encouraged to participate more fully within the community had a challenging time transferring learning to those new communities and actually becoming a part of them. (Schieber, 2016, p. x)

Another study conducted by Biasutti and Frate (2018) that included a 20-item assessment measured "the metacognition of groups based on their knowledge of cognition, planning, monitoring and evaluating" (p. 1321). The researchers sought to demonstrate the hypothesis that research on metacognition should not be limited to a focus on individuals. Study results confirmed that "metacognition should also be considered in a group dimension rather than only as a reflection of individual behavior, and it should be a relevant construct for understanding online collaborative processes" (Biasutti & Frate, 2018, p. 1321).

From these examples of research spanning three decades, it is plausible to infer that the complexity of assessing and teaching 21st century skills—these include but aren't limited to critical thinking, effective communication, problem-solving, professionalism, and teamwork—is driven by at least three factors:

- the importance of considering the demands of higher-order thinking skills (metacognition) in professional tasks, especially given the social nature of workplace applications;
- the likelihood that discrete skills, though easier to measure, are not generalizable or transferable across domains; and that
- competencies more accurately reflect the real-world demands of tasks in which skills are applied in concert, along with other attributes, but may be more difficult to measure.

A 2012 report by the National Research Council (NRC), *Education for Life and Work: Developing Transferable Knowledge and Skills in the 21st Century*, builds on the work of the SCANS report and makes the case for "deeper learning," which the NRC committee defines as

> the process through which an individual becomes capable of taking what was learned in one situation and applying it to new situations (i.e., transfer). Through deeper learning (which often involves shared learning and interactions with others in a community), the individual develops expertise in a particular domain of knowledge and/or performance. (p. 20)

This call for deeper learning, especially the emphasis on process, is significant in expanding views of learning as a series of skills to be mastered.

Indeed, among the many evidence-based arguments presented in the NRC report is the importance in differentiating between skills and competencies:

> In contrast to a view of 21st century skills as general skills that can be applied to a range of different tasks in various academic, civic, workplace, or family contexts, the committee views 21st century skills as dimensions of expertise that are specific to—and intertwined with—knowledge within a particular domain of content and performance. To reflect our view that skills and knowledge are intertwined, we use the term "competencies" rather than "skills." (p. 3)

Embedded in this distinction that the Committee draws is also the implication that "domains of expertise" are contextual, that is, "specific to domains of content and performance." This is the heart of the matter when it comes to assessment as well as classroom-based learning. The question of both practical and theoretical importance, then, is how "deeper learning" can be properly assessed when it may involve intrapersonal and interpersonal skills in cognitive domains such as mathematics:

> Unlike skills in the cognitive domain, those in the intrapersonal and interpersonal domains are not particularly prominent in the mathematics curriculum reform documents. Historically the interpersonal and intrapersonal domains have been represented in research conducted on mathematics teaching and learning (McLeod and Adams, 1989; McLeod, 1992; Schoenfeld, 1992), but they have tended to receive less attention as curricular or instructional outcomes. The two prominent areas of overlap between 21st century skills and learning goals for school mathematics in these domains are *self-regulation and motivation/persistence* [emphasis added]. (National Research Council, 2012, p. 125)

This report makes an invaluable contribution to educators, researchers, and policymakers, underscoring a number of points made in the foregoing. One aspect of these research findings is that policymakers review the reliance on standardized tests as measures of educational

accountability. There is more to the development of transferable, 21st century skills than "bubble tests" are likely to capture.

Not the least of these evidence-based insights are those related to writing analytics—understood as involving metacognition and social competencies:

> The curriculum [Seeds of Science/Roots of Reading] is designed to foster deeper learning in the cognitive domain, through all of the reading, writing, and inquiry activities. At the same time, deeper learning of intrapersonal competencies is supported by the individual and group reflection activities, which encourage metacognition, taking personal responsibility for one's learning, stamina, and persistence. In the interpersonal domain, deeper learning is fostered by ongoing collaboration, including the discussions about the readings, the small group collaborative investigations, the discourse circles, and even in the division of labor students work out for extended investigations or projects. Reflection activities encourage students to reflect not only on their learning but also on how well their group cooperated and how they could improve their discussions. (National Research Council, 2012, p. 115).

Broadening the analytical perspective to include the variety of social contexts in which adults function, the "life-course" approach to writing can provide a lens through which researchers can view the contributions of life experiences—including those of the workplace. In considering the experiences of working adults, Brandt (2018) presents a vector for what could be termed a "more nuanced investigation" of writing:

> . . . the life-course orientation has much to offer the field of writing studies. It helps to get beyond treating writing ability as a skill set that accumulates as a property of the individual—a view that dominates curriculum, assessment, policy, and public perception. (p. 247)
>
> This occupational research, built upon interviews with adults recounting their uses of writing across their careers, provides insight into the contemporary workplace where "writing is both a means and end of production . . . having become a dominant form of labor for millions of Americans." (p. 250)

In the area of workplace literacy, writing analytics may also have an important role to play, especially with its emphasis on justice, "a form of fairness reliant on moral philosophy, . . . attention to context, and dedication to supporting the least advantaged" (Kelly-Riley & Whithaus, 2016; Moxley et al., 2017, p. xi; Poe & Inoue, 2016). Again, Brandt's analysis of working adults can provide insight for researchers interested in how writing is impacted by an author's anticipation of prejudice in his or her audience. In one case, a Latina police detective was "aware that some of the people who read her work 'might not think I can produce . . . I try to do them [reports] as best I can because sometimes that is all people see and I'll be judged by that

[report quality]" (Brandt, 2018, p. 254). In another case, made salient by the example of a member of a LGBTQIA writers' group, Brandt concludes:

> Particularly given their collective character, cultural and political movements in different historical times help to organize social convoys of people who develop their literacy together within a particular historical horizon of consciousness. (p. 260).

In their willingness to advance opportunities to learn across all communication settings, writing analytics researchers are sensitive to context and dedicated to supporting all learners. Such an integrative framework may indeed reinforce (as suggested by Brandt's "life-course" approach to writing) the salience of social support in the transfer of writing skills (as noted in Schieber, 2016) and the fostering of new frameworks and methods for investigating transferable interpersonal (Reese et al., 2018) and intrapersonal competencies (Tate & Warschauer, 2018).

### 3.3 An Occupationally Oriented Approach

To illustrate the power of an occupationally oriented approach, consider how a few of the SCANS competencies and foundation skills are displayed in jobs across industry sectors. From a content standpoint, the SCANS research provides job-task information for three competencies and one foundation skill related to the construction contractor role. These linkages are illustrated in Table 3.

**Table 3**

*SCANS Competencies/Foundation Skills for Construction Contractor Role*

| SCANS competency/ foundation skills | Competency definition | Tasks |
|---|---|---|
| Organizing and Maintaining Information | Organize and maintain the information needed to administer a construction project. | • Plans the kinds of information required to administer and track project costs, materials, equipment, and time<br>• Breaks down information categories into basic elements to integrate into overall project |
| Allocating Material and Facility Resources | Allocate and deploy equipment for a construction project. | • Recognizes the importance of project planning<br>• Establishes a construction schedule and timetable<br>• Coordinates equipment resources with the schedule |
| Serving Clients/Customers | Serve customers in a way that satisfies them and allows the contractor to remain in business. | • Identifies the clients' needs both formally and through informal means and determines relative priority that the client places on project elements, including time, quantity, and quality<br>• Convinces clients that he/she is striving to meet their needs<br>• Shares responsibilities and frustrations with project progress<br>• Ensures that client needs are met |
| Seeing Things in the Mind's Eye (Foundation Skill) | Visualize the final construction project from a preliminary outline. | • Obtains and evaluates the description verbally or in a rough draft<br>• Mentally organizes the elements of the project (e.g., height, weight, strength, durability)<br>• Constructs and combines the elements in a time sequence for the finished job |

Consulting the information in Table 3, for instance, educators could focus on the tasks involved in a project manager role to identify the basic skills and higher-order thinking skills (e.g., "Seeing Things in the Mind's Eye") that might be involved in accomplishing these tasks. For instance, "Plans the kinds of information required to administer and track project costs, materials, equipment, and time" will necessarily involve researching information (reading) and mathematical reasoning, along with an understanding of time management—skills that, once developed, theoretically can be transferred to a variety of roles. As the forerunner to the NRC report, the data from SCANS also highlights the contribution of interpersonal skills in meeting the needs of a team and customers alike, but the importance of knowledge of the specific product

or service cannot be understated. Knowledge of the industry domain and the role of a particular occupation, then, is invaluable.

## 4.0 Texas Workforce Commission's Standards 2.0

For those interested in occupational field research, the SCANS database serves as a precursor to the U.S. DoL's O*NET. In order to provide a framework to assess the value of using job-task analysis for assessment and contextual instruction, a starting place can be SCANS research tied with the use of O*NET. On a parallel track with the SCANS research reports in the early 1990s, the DoL developed O*NET as a free online resource for employers and educators to benchmark job requirements against data derived from job analysis, continuously updated analysis that as of 2020 includes almost 1,000 jobs. Recent analyses have used O*NET to identify critical competencies for the 21st century workforce (Burrus et al., 2013). An example of how instructors may apply O*NET to help learners prepare for work is found in the Texas Workforce Commission's Standards 2.0.

Today, the O*NET database serves as one tool for educators to align instruction with work-related requirements. An example of where instructors and employers joined forces to align education standards with competencies and skills is the Texas Workforce Commission's Standards 2.0 project—a project on which I worked as a member of a team of consultants and as the project manager.

The objective of this work, which spanned from 2017-2018, was to align existing education standards for adult learners with industry-specific examples that would help prepare students for success at work. The mandate was to focus on entry- and mid-level jobs with career potential in high-growth industry sectors. Educational Testing Service (ETS), with Principal Investigators Dan Hawthorne and María Elena Oliveri, served as the research partner in the project during a three-stage process:

- First, ETS identified almost 200 jobs across four Texas high-growth industry sectors—Construction/Extraction, Healthcare, Transportation/Distribution/Logistics, and Manufacturing—that were in need of entry- and intermediate-level skilled workers.
- Second, employer focus groups used "Detailed Work Activities" from O*NET to provide examples of job-specific information in which workers had to apply skills to achieve their job objectives.
- Third, educators and employers worked together to verify the linkages.

As an example of how educators may apply Standards 2.0, consider the academic skill of "Listening," which calls on students to "Apply listening skills in informal and formal situations as an individual and as a member of a group in a variety of settings (e.g., lecture, discussions, conversations, team projects, presentations, and interviews)." The O*NET Detailed Work

Activities serve as the contextual bridge between the academic skill of "Listening" and related work contexts provided by employers in four different industry sectors, as seen in Table 4.

Listening—or "Active Listening" in O*NET terms—is associated with asking questions to gain clarification or additional information. An exercise to challenge students' listening skills would provide students with incomplete oral information and then, based on a specific context, require them to ask relevant questions to meet the needs of a particular situation involving team-based problem solving. Role-playing in realistic scenarios, as seen in the "performance task" approach above, can incorporate meaningful ways to assess this skill.

**Table 4**

*Listening: O*NET Detailed Work Activities and Related Industry Examples*

| O*NET detailed work activity | Texas industry example |
|---|---|
| Receive information or instructions for performing work activities. | **Manufacturing**: Listens to shift start-up meeting for full instructions on production orders. Asks questions about orders coming in. Receives information from and delivers communication to departments regarding orders and line status. |
| Communicate with clients about products, procedures, and policies. | **Construction/Extraction**: Listens to customer to help determine customer's comfort needs. Understands instructions from supervisors and management team. |
| Answer patient call signals, signal lights, bells, or intercom systems to determine patient needs. | **Healthcare**: Hears what a patient says when they describe that they are in pain or suffering (is this a request they are making?). |
| Confer with customers or users to assess problems. | **Transportation/Distribution/Logistics:** Listens to customer and understands their needs to ensure that service expectations are met. |

What is important to note for educators, researchers, and employers is that the job-related information in the O*NET database includes much more than skills. For example, for each occupation, the database includes personality attributes—or "work styles" as they are called in O*NET—which play an important role *in combination with* skills. Personality dimensions such as *Cooperation, Attention to Detail,* and *Adaptability/Flexibility* contribute to successful performance on the job, often seen in the examples offered by employers that focus on customers—in fulfilling orders, meeting customer needs, and satisfying customer expectations.

Also in the Texas Standards 2.0 document, there is a breakdown of the job tasks with illustrative employer examples for the academic standard related to writing. This breakdown is shown in Table 5 in relationship to the O*NET elements associated with this writing standard: "Writing—Communicate effectively in writing as appropriate for the needs of the audience" and "Written Expression—Communicate information and ideas in writing so others will understand."

**Table 5**

*Writing: O*NET Detailed Work Activities and Related Industry Examples*

| O*NET detailed work activity | Texas industry example |
|---|---|
| Prepare reports. | Industry: Construction and Extraction<br>Position: Service Unit Operator—Oil, Mining, Gas<br>Example: Prepares reports of services rendered, tools used, or time required for billing purposes. |
| Prepare and process emails, memos, correspondence, and other documents. | Industry: Healthcare Sciences<br>Position: Receptionist<br>Example: Reproduces documents from notes or rough drafts utilizing computer software. |
| Prepare and process emails. | Industry: Transportation and Logistics<br>Position: Logistics Manager, Supervisor, Clerk<br>Example: Writes emails to local vendor about the quality of products that are being delivered through a contract. |

As noted above, one complexity of aligning academic skills and workplace applications is that skills are used in combination with each other along with other attributes in performing job tasks. Analyzing these tasks to identify the relevant attributes—including personality or work styles—and rolling these up into competencies (as seen in the SCANS database) is an important role for field research. The challenge for educators, then, is how to assess these attributes to measure student progress (in a summative sense) or to diagnose student needs (in a formative sense). The underlying assumption of meeting such challenges is that a student's success in an academic context that mirrors the demands of the workplace will translate into increased proficiency in performing job tasks where literacy skills are embedded: that is, there will be better chances of ensuring the transfer of learning.

One significant initiative in assessing student progress that seeks to bridge the gap between employer expectations and college outcomes is found in the VALUE assessment rubrics of the Association of American Colleges and Universities (AACU). Intended to assist instructors and students in discussing academic performance (rather than a basis for grading), the rubrics provide descriptions of performance in writing, quantitative literacy, and critical thinking. These three "intellectual skills" were the highest rated by AACU institutions "that have a common set of learning outcomes for all students" (Hart Research Associates, 2016, p. 4).

In the area of Critical Thinking, the VALUE Rubric highlights the fact that higher-order thinking skills—among them, "thinking precisely about thinking"—are "more difficult to learn or teach but also more valuable because they are more likely to be useable in novel situations

(e.g., situations other than those in which the skills were learned)" (Association of American Colleges and Universities, 2009). The Written Communication rubric provides benchmarks, milestones, and capstone descriptions across five areas of writing, including "Genre and Disciplinary Conventions," defined as "Formal and informal rules inherent in the expectations for writing in particular forms and/or academic fields." The area in which the needs of employers and workplace context is explicitly addressed is Quantitative Literacy, where the rubric is introduced as follows:

> Quantitative Literacy Across the Disciplines
>
> Current trends in general education reform demonstrate that faculty are recognizing the steadily growing importance of Quantitative Literacy (QL) in an increasingly quantitative and data-dense world. AAC&U's recent survey showed that concerns about QL skills are shared by employers, who recognize that many of today's students will need a wide range of high level quantitative skills to complete their work responsibilities. Virtually all of today's students, regardless of career choice, will need basic QL skills such as the ability to draw information from charts, graphs, and geometric figures, and the ability to accurately complete straightforward estimations and calculations.

Looking at how these three skill areas might be integrated by instructors, the Quantitative Literacy rubric suggests that "faculty must develop assignments that require students to create work products which reveal their thought processes and demonstrate the range of their QL skills."

## 5.0 Workplace English Communication Skills as a Paradigm for Assessment

It has been clear at least from the origins of the SCANS research in the 1980s that a focus on contextual skill applications—as well as resources that can help educators become more aligned with the needs of the workplace—should be based on occupational research, including job-task analysis. This research would provide a foundation for relevant assessments that are tied to competencies. The SCANS research—with its focus on what work requires of schools (U.S. Department of Labor, 1991)—anticipated the needs of K-12 educators with publications such as *Learning a Living: A Blueprint for High Performance* (U.S. Department of Labor, 1992a) and *Teaching the SCANS Competencies* (U.S. Department of Labor, 1993).

One promising initiative is the Kitchen Design (KD) prototype, a work-based instructional and assessment module, as described in Appendix B. (For more on the prototype, see Oliveri, Slomp, Elliot, et al., 2021, this issue and Slomp et al., 2021, this issue.) In this module, students assume the role of a project manager overseeing a small construction project. They are asked to work though real-world scenarios and solve problems related to email, planning, and communicating, among other tasks. There will be more about this module's potential later in this article. While the intended audience for this online resource is principally students and teachers,

its potential utility could be "bridging" or aligning activities among employers, schools, and training programs. This is especially true because, as seen in the original Texas Standards project and in the development of the AACU VALUE rubrics, employers are typically not involved in developing school-based content or assessments (Association of American Colleges and Universities, 2009). The omission of the employer perspective in the development of adult education and literacy standards in Texas was a principal driver for the Standards 2.0 project.

The KD developers' choice of the job of project manager as a focal point of the instructional simulation anticipates the need for a more discrete enumeration of sub-tasks and related skills. As a formative assessment tool, the KD simulation positions the student/learner in the project manager role by applying skills in an organizational context and in combination to accomplish necessary tasks. The SCANS Competencies and Foundation Skills' evolution into O*NET underscores the need for employers and their education partners to deal with such "bottom line" issues that call for a more competency-based approach, where skills-attitudes-abilities-knowledge tools and technologies come together to meet the needs of internal and external customers.

As mentioned above, the project manager role is especially well-chosen because it is not bound to one industry sector: in almost any industry, it can serve as a stepping-stone for a front-line worker to become a peer leader. From a career path perspective, success as a project manager can provide opportunities within an organization or for a lateral move into another company or industry. For purposes of demonstrating the power of O*NET, as illustrated earlier**,** one occupation aligned with the project manager role is that of Construction Manager as found in the SCANS database (Table 6).

Scanning information available for this position in O*NET, one finds lists of critical tasks, skills, knowledge, technologies, abilities, and work styles. The top five Generalized Work Activities and their definitions are shown in Table 6.

**Table 6**

*O*NET: Top 5 Generalized Work Activities*

| O*NET generalized work activity | Description |
|---|---|
| Communicating with Supervisors, Peers, or Subordinates | Providing information to supervisors, co-workers, and subordinates by telephone, in written form, email, or in person. |
| Making Decisions and Solving Problems | Analyzing information and evaluating results to choose the best solution and solve problems. |
| Resolving Conflicts and Negotiating with Others | Handling complaints, settling disputes, and resolving grievances and conflicts, or otherwise negotiating with others. |
| Scheduling Work and Activities | Scheduling events, programs, and activities, as well as the work of others. |
| Getting Information | Observing, receiving, and otherwise obtaining information from all relevant sources. |

Using this kind of information in the development of a scenario-based simulation in the KD module calls for representative tasks that reflect the actual demands of the job, but also (from an assessment standpoint) tasks that reveal observable and measurable skills, abilities, knowledge, or work styles (competencies). Moreover, to be faithful to how these tasks are performed in a variety of contexts, the student must apply these attributes in combination and simultaneously.

The development of the VALUE rubrics by AACU, partially in response to a survey of employers, demonstrates the importance of seeing how skills can be integrated across disciplines in post-secondary classes (Association of American Colleges and Universities, 2009). One example (as mentioned previously) is Quantitative Literacy, in which students need to be able to communicate their reasoning: "Expressing quantitative evidence in support of the argument or purpose of the work (in terms of what evidence is used and how it is formatted, presented, and contextualized)" (Association of American Colleges & Universities, *Qualitative Literacy*, p. 2)

### 5.1 WEC Email Kitchen Design Communications Module: Case Study of 2019 Pilot Project in North Carolina

Tri-County Early College (TCEC) is located in the southern Appalachian town of Murphy, North Carolina. The target population for early colleges is first-generation college students, those at risk of dropping out, or members of other historically underserved populations. TCEC students can earn the entire 60+ hours of credit needed to obtain an Associate's Degree in college transfer credits while in high school. Using experiential methods like project-based learning and competency-based learning schoolwide, TCEC students complete service-learning requirements working with community partners to solve job-related problems. In project-based learning projects, students work collaboratively toward a common goal to master the fundamental concepts of a specific discipline or curricular area. Student performance is evaluated

individually, based on the quality of products, the depth of demonstrated content knowledge, and contributions made to their specific project team.

In 2019, TCEC leaders welcomed the opportunity for students to participate in the WEC KD simulation, including the ability to communicate through email—a skill that is ubiquitous in the business world as well as in the accomplishment of tasks outside of work. What makes the use of email unique in the work world is the organizational context in which employees must communicate based on company protocols (Dias et al., 2013). While these protocols may vary across organizations, a common characteristic is that they call on users to observe rules intended to expedite communication. Employees should observe these rules if they are to be effective and taken seriously as partners in communication (Bargiela-Chiappini et al., 2013). Habitual use of informal forms of discourse that may be acceptable between friends or relatives or abbreviated textual constructions common to social media (e.g., for texting or Facebook posts) need to be replaced by more formal structures.

The KD module addresses these features of organizational discipline. The module's first task requires that the new employee/student, acting in the role of project manager at a custom construction company, become acquainted with her team members. The new employee sorts through a series of emails from five different employees in the company and is asked to decide which to answer first.

At first glance, this appears to be a simple task: one could, for instance, adopt the *implicit* rule of answering the emails in the order in which they were received. On closer examination, however, the new employee might be inclined to answer the email received from her boss first. Others might see the need to follow the directions from the IT department to gain access to the system on a regular basis. Out of the five messages that the new employee receives on her first day, there are other messages that would appear not to be of high priority, such as joining the coffee club. But it is precisely the student's ability to prioritize—with the scant information given (i.e., who sent the email and the subject line)—that calls on the combined application of two skills: skimming and scanning for information and reasoning logically with information.

It is instructive, from an assessment perspective, to see how students responded to the email task in the KD module, given the request that they provide a rank order of their responses—which would be first and which would be last. These responses suggest that the role of background knowledge can also come into play: choosing between answering one's boss *first* versus the IT request—simply by seeing who sent the message and the subject line—could be driven by a person's understanding of what it means to operate within an organization's computer email system. Choosing the response about joining the coffee club last would appear to be the appropriate response.

In the second half of the task, students are provided the full text of each of the five emails and then asked if they would reconsider their priority response rankings. Again, the students' reasons could provide useful data points to teachers, assuming a blended-learning approach, in which there could be an active discussion on which rationale would be the most persuasive. The

larger point to be made, however, is that the KD prototype encourages students to reflect on the choices and then gives them an opportunity to change their rankings, a point of specific interest for researchers.

There is something more being assessed in this module than simply reading emails: the purpose is to tap into students' metacognitive abilities. Having students explain their choices in writing—with the prospect of defending their decisions in a blended-learning setting—could reveal how students think and are able to articulate their thinking. In this form, the instructional design could differentiate among students in terms of their relative metacognitive abilities in measurable and observable terms: they are having to explain their reasoning here in writing. As mentioned earlier, in both academic (e.g., in the Quantitative Literacy VALUE rubric) and workplace contexts, students/workers need to have thought through their own reasoning in order to be able to respond to questions about, or critiques of, their findings (Association of American Colleges and Universities, 2009). This would be especially important when an individual is functioning as a member of a team and engaging in collaborative problem-solving around a critical incident issue involving safety, quality, or productivity.

To illustrate how assessing metacognition is accomplished in the KD prototype, here are some qualitative examples from the assessment as it was field tested in the fall of 2019 at TCEC. In this task item, students were asked to explain their rationale for changing or not changing their priority ranking based on reading the body of an email. Below are their explanations:

- "Reading the emails did not change my answer because answering and reading IT alert emails is important to make sure everything is working and they have everything they need."
- "People are important so I changed my answer to choose Volk's [the boss's] email to respond to first. I'd want to make sure my team knew I thought they were important."
- "Tools are important, people are important, meeting with team members is important, coffee club is less important."
- "I chose the IT email to respond to first because you gotta verify who you are before you can start your job at a company."
- "I CHOSE VOLK'S EMAIL FIRST BECAUSE HE IS MY SUPERVISOR . . . "
- "I chose the last email to read first cause it's the oldest email and the last email to read because it is the newest."

This type of qualitative data could provide instructors with some useful points for class discussions that set the first stage of email writing: focusing on the subject line, name of sender, and the content of the email provides clues for how an employee should respond, not only in timeliness but also in considering the audience to whom the email should be addressed—all of which are a closer manifestation of the use of skills in combination in real-world settings. The KD module goes into greater depth in the construction of emails as the tasks become more complex in managing a virtual team and meeting customer (and a boss's) expectations.

The initial exercise reveals how attentive employees need to be in a business environment to competing demands for their attention and the importance of timely responses. Researchers could also examine such qualitative responses to see what patterns of reasoning are being followed, relative to the demands of the task presented in the simulation, in considering what may be parallel processes in evidence as students sort through emails and establish their own criteria for choosing to rank email responses in a particular order (see also Oliveri, Mislevy, & Slomp in this issue for an elaboration of linguistic, cognitive, and substantive response analyses using digital tools such as DocuScope).

### 5.2 Kitchen Design Scheduling Module: A Higher-Order Cognitive Task

Another section of the KD prototype involves scheduling work activities. Developing and managing a schedule is at the heart of how project managers spend their time. In the KD prototype scheduling task, the student is given two emails from an associate. The emails present different activities and provide general guidance about the order of activities to be placed in the construction schedule. The associate's first email suggests that the new project manager may have minimum background in completing this assignment. In a follow-up email, she provides more information about the specific order in which activities must be scheduled. This information includes a list of constraints, highlighting the elements of the schedule that are dependent on others. For instance, the second email specifies that the installation of equipment and painting can only be conducted after all other activities—plumbing, wiring, gas installation, and ventilation—have been completed. The associate supplies a form for the project manager that, when complete, will lay out the tasks, the amount of time each task will take, and the time allotted by day(s) within a week's time frame.

A potentially valuable discussion for students in a blended-learning setting would be to start from the completed schedule and reason backwards as to why certain activities can be completed simultaneously while others must be completed at separate times, even if on the same day. Additionally, the students could be tasked with re-writing the associate's two emails by consolidating the information in a more effective way. Finally, considering the information provided by O*NET on the Construction Manager's job, students could be asked to choose and defend (with examples) the skills/knowledge/work styles/technology that would be most critical to successful completion of this task. Selected O*NET elements that could be featured in such an assignment include those shown in Table 7.

**Table 7**

*O*NET Elements and Related Knowledge and Work Styles for Construction Manager Job*

| Skill | Knowledge | Work style |
|---|---|---|
| Reading Comprehension | Building and Construction | Attention to Detail |
| Critical Thinking | English Language | Dependability |
| Coordination | Administration and Management | Cooperation |
| Active Learning | Engineering and Technology | Analytical Thinking |
| Time Management | Design | Persistence |

With the understanding that project planning involves metacognitive skills, O*NET data could help students begin to articulate their thinking in the context of the scheduling task. Doing so could help underscore how employees must engage with texts and apply what they read to complete a plan that will guide others in scheduling their work most efficiently and ultimately in meeting customer requirements. Educators also could have students share their results with area employers. Students and teachers could then benefit from employer feedback on how the mastery of such competencies could better prepare students for success in a variety of jobs.

### 5.3 Implications from the Workplace English Communication Assessment and Instruction

The last suggested activity involving scheduling provides a basis for instructors and curriculum developers to bring the demands of the workplace into the classroom. As should now be clear, tasks or questions that rely on students' demonstrating one skill out of context (e.g., on a worksheet) may be easy to grade, but such practices do little to help students transfer a skill learned to the world of work (National Research Council, 2012).

The KD prototype allows students and their teachers to get a sense of how skills are applied in combination with other attributes. In a blended-learning setting, teachers would have an even greater opportunity to observe how students interact with the challenges and with each other. Class discussions where students divide into breakout groups—then present their group solutions to the class as a whole—may surface alternative ways of solving a problem. At the very least, these discussions provide the teacher with an understanding of how successful students have been in meeting the demands of the tasks that confront them, gauging their seriousness and ability to put themselves into the project manager role.

As a summative activity, having students rate themselves anonymously as members of a team using a behavioral rating scale (with an emphasis on work styles) would provide additional feedback for each group and the class as a whole. Using the SCANS interpersonal behaviors for the ratings, the students could rate themselves across the following dimensions:

- share tasks necessary to complete a project;
- encourage others by listening and responding appropriately to contributions;
- recognize and build upon individual strengths;
- resolve differences for the benefit of the group as a whole; and
- responsibly challenge existing procedures, policies, or authorities. (U.S. Department of Labor, 1993, p. 33)

Group members could draw from their individual team members' rating sheets and then discuss what they see as relative strengths and challenges for the team, based on the team member self-ratings.

Introducing students to O*NET surfaces the kinds of tasks and their associated attributes in specific jobs. O*NET also introduces students to the importance of work styles, especially as they are involved in collaboration with others (Grummon, 1997). Also referred to as "soft skills" or "employability skills," work styles most often surface in the performance of tasks that require social interaction. In the case of the O*NET profile of a technical writer, for instance, students would find the following representative task: "Confer with customer representatives, vendors, plant executives, or publisher to establish technical specifications and determine the subject material to be developed for publication." As an exercise, students could then examine the profile's enumeration of skills and work styles to identify those that would be called upon to be successful at performing this task: most likely responses for the students to identify (and then justify their choices) would be skills including active listening and critical thinking and work styles such as cooperation, detail consciousness, and dependability.

What the SCANS research makes clearer is how important it is to understand these applications in competency-based terms. Having students think of their skill sets in these terms facilitates the transition to work and to considering career options. It is important for educators to consider what employers are saying (e.g., in the 2020 Chamber of Commerce report) about the relative power of competencies versus academic credentials for precisely this reason.

As a summative activity, teachers could ask students to think about their progress in mastering the challenges presented in the KD prototype in a variety of ways. The typical approach might have students compare their ability to read and respond to emails as a discrete communication activity. Having students reflect on their reasons for communicating—and what made for more successful communications—should support the role of competencies as being truer to the context and content of skill "applications."

The project manager role, as reflected in the KD simulation and in real life, calls on project managers to act as peer team leaders. As participants in a team, they should interact with other team members to influence and motivate rather than to direct or issue "orders." The SCANS

competencies and the Texas Standards 2.0 framework illustrate the importance of behaviors that all team members must strive to incorporate in their work if they are to be successful. Project managers must call on these behaviors and often remind team members of the importance of their individual contributions while maintaining principal responsibility for the project achieving its goals.

### 5.4 Implications for Researchers

With a focus on assessing competencies that are measurable and observable, researchers might want to better understand the thinking and motivation that underlie specific behaviors. Metacognition, mentioned above, is a critical contributor to successful planning. Assessing it tends to be best approached from an individual standpoint. There is research, however, that suggests that metacognition might also be framed in studies of team interactions. In one study, researchers compared how two different groups of college students "regulated behavior during cooperative activities and how group members perceive[d] their skills and reflect[ed] on group potentialities" (Biasutti & Frate, 2018, p. 1321). The findings of this study suggest that "metacognition should also be considered in a group dimension rather than only as a reflection of individual behavior, and it should be a relevant construct for understanding online collaborative processes" (Biasutti & Frate, 2018, p. 1321). From the perspective of literacy research cited earlier, a study of writing as a collaborative process could extend the aspect of metacognition again with the notion of skills being used in concert and in a social context (O'Donnell et al., 1986) as simulating work as a member of a team.

## 6.0 Conclusion

In conclusion, I return to the five research questions I posed at the beginning of this article.

1. *How can educators better ensure the transfer of skills from the classroom to other domains?*

The key to transfer is for the learning environment to reflect the demands of specific domains or contexts. By having students work collaboratively and use their skills in concert, instructors can begin to simulate the ways in which skill applications will arise. Using tools such as O*NET, students can become aware of the domain knowledge, critical tasks, and work styles in occupations that motivate them from a career readiness perspective. Instructors themselves will benefit from using O*NET and data from studies like Texas Standards 2.0 to become more familiar with tasks that are clearly more complex than they appear in discrete assessments of decontextualized skills.

2. *In what ways do competencies contribute as measurable constructs in addition to skills?*

The use of competency language, stated in behavioral terms, helps position a more holistic and realistic approach to assessment than discrete skills assessment. Competency constructs can help instructors and students envision how to transfer what is taught to new situations, but they also

pose a challenge in how they are best evaluated. As instructors become more familiar with the demands of work requirements, they can develop rubrics to rate their students and have students rate themselves and their peers. Using behaviors associated with teamwork (as seen in the SCANS competencies), students could elaborate on their anonymous self-ratings by also rating themselves against their peers and then have their ratings validated or critiqued by their peers and instructor. These rubrics in turn can be tested and shared with employers to substantiate the achievement of skills necessary for success in the local labor market—as envisioned by SCANS and Standards 2.0.

3. *Can collaborative problem-solving serve as an effective metacognitive strategy?*

A growing body of research indicates that students working collaboratively as members of a team not only simulates what is more indicative of the work world; it also provides a strong foundation for the use of higher-order thinking skills. To the extent that students have to elaborate on their reasons for choosing a certain answer or way of proceeding (evidence of metacognition provided orally or in writing), they become more aware of the processes they use—processes that can be adapted and refined when they are faced with different but related challenges in different contexts. To the extent that such strategies call upon higher-order thinking skills, researchers and instructors should not ignore the important contributions of social structures to support the development of these skills as part of a set of interpersonal and intrapersonal competencies.

4. *How does the alignment between academic skills and job requirements highlight the importance of situated learning?*

It is tempting to consider data such as that provided in SCANS' *Skills and Tasks for Jobs* or the Texas Standards 2.0 project as sufficient for instructors to use in more contextual instruction. However, it is more likely that instructors (as part of field research teams) could perform a service to employers and make their instruction more dynamic and their assessments more reflective of the cognitive demands of work. Techniques such as cognitive task analysis could begin to incorporate findings from studies of local workplaces by engaging workforce practitioners as contributors to the community competency knowledge base.

5. *Can job simulations that combine learning and assessment play a role in the transfer of learning to different domains?*

Job simulations such as the KD prototype have the advantage of providing blended-learning solutions that embed formative assessment of occupationally specific competencies.

Based on the evidence offered in this article, I propose that there is a good case to be made for using research—both academic and field-based—in developing assessments that reflect how skills, now better understood as multi-dimensional competencies, are applied in the world of work. While the U.S. Chamber of Commerce Foundation (2020) report makes the case that

competencies are preferable to academic credentials as the basis for hiring, perhaps this dualism is not quite the solution. While this message of employers to the academic community is not a novel one, alignment of academic assessment and instruction to workplace requirements is best considered as a way to re-position student success in both worlds.

The advantage that researchers and educators have at the present moment is captured in major syntheses of evidence-based findings such as those documented in the NRC's *Education for Life and Work* report. Among the more powerful and relevant recommendations for educators in search of keys to improved practice is the following:

> Foundations and federal agencies should support further research designed to increase our understanding of the relationships between 21st century competencies and successful adult outcomes. To provide stronger causal evidence about such relationships, the programs of research should move beyond simple correlational studies to include more longitudinal studies with control for differences in individuals' family backgrounds and more studies using statistical methods that are designed to approximate experiments. Such research would benefit from efforts to achieve common definitions of 21st century competencies and an associated set of activities designed to produce valid and reliable assessments of the various individual competencies. (National Research Council, 2012, p. 5)

As part of that hopeful future, occupational research can play an important role in the basic step of aligning educational practices with workplace requirements—especially in the area of designing complex assessments of communication skills.

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## Appendix A: SCANS Skills

SCANS Skills are grouped in two areas: (1) foundation skills and (2) workplace competencies.

1. Foundation Skills are defined in three areas: (a) basic skills, (b) thinking skills, and (c) personal qualities.

(a) Basic Skills: A worker must read, write, perform arithmetic and mathematical operations, listen, and speak effectively. These skills include:

(1) Reading: locate, understand, and interpret written information in prose and in documents such as manuals, graphs, and schedules;

(2) Writing: communicate thoughts, ideas, information, and messages in writing; and create documents such as letters, directions, manuals, reports, graphs, and flow charts;

(3) Arithmetic and Mathematical Operations: perform basic computations and approach practical problems by choosing appropriately from a variety of mathematical techniques;

(4) Listening: receive, attend to, interpret, and respond to verbal messages and other cues; and

(5) Speaking: organize ideas and communicate orally.

(b) Thinking Skills: A worker must think creatively, make decisions, solve problems, visualize, know how to learn, and reason effectively. These skills include:

(6) Creative Thinking: generate new ideas;

(7) Decision Making: specify goals and constraints and generate alternatives, consider risks, and evaluate and choose the best alternative;

(8) Problem Solving: recognize problems and devise and implement plan of action;

(9) Visualize (“Seeing Things in the Mind's Eye”): organize and process symbols, pictures, graphs, objects, and other information;

(10) Knowing How to Learn: use efficient learning techniques to acquire and apply new knowledge and skills; and

(11) Reasoning: discover a rule or principle underlying the relationship between two or more objects and apply it when solving a problem.

(c) Personal Qualities: A worker must display responsibility, self-esteem, sociability, self-management, integrity, and honesty. These qualities include:

(12) Responsibility: exert a high level of effort and persevere toward goal attainment;

(13) Self-Esteem: believe in one's own self-worth and maintain a positive view of oneself;

(14) Sociability: demonstrate understanding, friendliness, adaptability, empathy, and politeness in group settings;

(15) Self-Management: assess oneself accurately, set personal goals, monitor progress, and exhibit self-control; and

(16) Integrity and Honesty: choose ethical courses of action.

2. Workplace Competencies are defined in five areas: (a) resources, (b) interpersonal skills, (c) information, (d) systems, and (e) technology.

(a) Resources: A worker must identify, organize, plan, and allocate resources effectively.

(1) Time: select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.

(2) Money: use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.

(3) Material and Facilities: acquire, store, allocate, and use materials or space efficiently.

(4) Human Resources: assess skills and distribute work accordingly, evaluate performance and provide feedback.

Examples: use computer software to plan a project; prepare a budget; conduct a cost/benefits analysis; design an RFP process; write a job description; develop a staffing plan.

(b) Interpersonal Skills: A worker must work with others effectively.

(5) Participate as Member of a Team: contribute to group effort.

(6) Teach Others New Skills.

(7) Serve Clients/Customers: work to satisfy customers' expectations.

(8) Exercise Leadership: communicate ideas to justify position, persuade and convince others, responsibly challenge existing procedures and policies.

(9) Negotiate: work toward agreements involving exchange of resources, resolve divergent interests.

(10) Work with Diversity: work well with men and women from diverse backgrounds.

Examples: collaborate with a group member to solve a problem, work through a group conflict situation, train a colleague, deal with a dissatisfied customer in person, select and use appropriate leadership styles, use effective delegation techniques, conduct an individual or team negotiation, demonstrate an understanding of how people from different cultural backgrounds might behave in various situations.

(c) Information: A worker must be able to acquire and use information.

(11) Acquire and Evaluate Information.

(12) Organize and Maintain Information.

(13) Interpret and Communicate Information.

(14) Use Computers to Process Information.

Examples: research and collect data from various sources, develop a form to collect data, develop an inventory record-keeping system, produce a report using graphics, make an oral presentation using various media, use on-line computer databases to research a report, use a computer spreadsheet to develop a budget.

(d) Systems: A worker must understand complex interrelationships.

(15) Understand Systems: know how social, organizational, and technological systems work and operate effectively with them.

(16) Monitor and Correct Performance: distinguish trends, predict impacts on system operations, diagnose deviations in systems' performance and correct malfunctions.

(17) Improve or Design Systems: suggest modifications to existing systems and develop new or alternative systems to improve performance.

Examples: draw and interpret an organizational chart; develop a monitoring process; choose a situation needing improvement, break it down, examine it, propose an improvement, and implement it.

(e) Technology: A worker must be able to work with a variety of technologies.

(18) Select Technology: choose procedures, tools or equipment including computers and related technologies.

(19) Apply Technologies to Task: understand overall intent and proper procedures for setup and operation of equipment.

(20) Maintain and Troubleshoot Equipment: Prevent, identify, or solve problems with equipment, including computers and other technologies.

Examples: read equipment descriptions and technical specifications to select equipment to meet needs, set up and assemble appropriate equipment from instructions, read and follow directions for troubleshooting and repairing equipment.

(Texas Higher Education Coordinating Board, 2010, pp. 49-51)

## Appendix B: Description of the Workplace English Communication (WEC) Prototype

Workplace English Communication is defined as a form of sophisticated discourse in which organizational and disciplinary norms for framing and communicating information are used for a variety of aims. Framed as a sociocognitive construct of writing expertise, the WEC domain model referenced in this special issue focuses on seven knowledge domains: metacognition, critical discourse, discourse communities, rhetorical aim, genre, communication task processes, and substantiative knowledge (see Corrigan & Slomp, 2021, this issue). As a form of WEC, Kitchen Design is a digitally delivered simulation involving complex tasks. Between 2018 and 2020, a prototype was developed using a scenario-based approach in which modules present opportunities for students to learn WEC by working in a fictitious company that specializes in designing and overseeing the construction of commercial and private kitchens. (For more on the prototype, see Oliveri, Slomp, Elliot, et al., 2021, this issue and Slomp et al., 2021, this issue.)