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DIFFERENTIAL EXPECTATIONS OF STUDENT PERFORMANCE ON OCCUPATIONAL SKILL ASSESSMENTS AMONG INDUSTRY PRACTITIONERS: A PENNSYLVANIA EXAMPLE

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Abstract

Assessments in occupational competency were developed and administered by the National Occupational Competency Testing Institute (NOCTI). The written components of these tests were criterion-referenced benchmarked by industry representatives and career and technical education instructors using the Nedelsky method, utilizing from 12 to 15 participants for each Job Ready test. The purpose of this study was to determine if there were any statistically significant differences in predicted cut scores between career and technical education instructors and their respective industry representatives. An analysis of the results indicated that the estimated *p*-value item difficulty as determined by industry representatives was higher than that of classroom/shop instructors. Also the expected performance cut score of a minimally competent entry-level worker as determined by industry representatives was generally higher than that from their instructor counterparts. They showed statistically significant differences in 10 of the 17 tests.

Introduction

The history of career and technical education in Pennsylvania and the nation is a long one. By the mid-1880s vocational education in the form of industrial education was synonymous with institutional programs for youths. The children of defeated Native American leaders were sent to the Carlisle Pennsylvania Indian School, and the curriculum was job training (Clarke Historical Library, 2008.). Some of the major landmarks in the history of vocational education in Pennsylvania included:

a) 1824 The Franklin Institute of the State of Pennsylvania for the Promotion of the Mechanic Arts is founded in Philadelphia
b) 1830 An Agriculture school is started in Bucks County
c) 1833 Governor George Wolf advocates adopting of the popular Swiss Fellenberg system of uniting manual labor and study
d) 1855 The founding of Farmers' High School of Pennsylvania, forerunner of The Pennsylvania State University, involving a very rigorous four year course in natural sciences
e) 1862 The name of the “Farmer’s High School” is changed to Farmers' College;
f) 1873 Governor John F. Hartranft advocates industrial schools
g) 1911 Vocational education advisors, experts on agriculture, mechanical drawing, and industrial education, are added to the DPI staff
h) 1913 The Showalter Act of 1913 sets up statewide vocational programs for agricultural and industrial instruction
i) 1917 The Federal Smith-Hughes Act brings Pennsylvania funds for skilled trades, handicrafts, and agriculture

Cooperation of the Department of Public Instruction (DPI) with the Department of Labor and Industry's Bureau of Rehabilitation had existed since the 1920s. In 1945, the General Assembly formally created the State Board for Vocational Education and specified that it was also the State Board of Vocational Rehabilitation. However, the new Board provided vocational education only for those needing rehabilitation. The federal government's National Defense Education Act, in 1958, was the beginning of a new emphasis on education throughout the country characterized by large entitlement grants. These sent funds from Washington D.C. to Pennsylvania. The State's Vocational Education Act of 1963 began the move that established separate Vo-Tech high schools all across Pennsylvania. The community college movement also emphasized vocational education. Both received much support from federal funds (Pennsylvania State Archives, n.d.).

By the 1960s, the vocational education system had been firmly established, and Congress recognized the need for a new focus. As a result, the 1963 Vocational Education Act, while still supporting the separate system approach by funding the construction of area vocational schools, broadened the definition of vocational education to include occupational programs in comprehensive high schools, such as business and commerce. The act also included the improvement of vocational education programs and the provision of programs and services for disadvantaged and disabled students.

The focus of the national and legislative movement was to properly equip secondary and postsecondary youths with the necessary tools that facilitate meeting the demands of emerging industries. If the United States is to remain at the forefront in the high-tech global marketplace, the workforce must posses the requisite technological competencies and academic skills

(Education Encyclopedia, 2007). The legislative acts, popularly known as Perkins of 1984, Perkins II of 1990, Perkins III of 1998 and Perkins IV of 2006 further emphasized the new focus of career and technical education. Students who complete an approved career and technical education program are expected to be ready for postsecondary education and work. "The purpose of this Act is to develop more fully the academic and career and technical skills of secondary education students and postsecondary education students who elect to enroll in career and technical education programs, by (1) building on the efforts of States and localities to develop challenging academic and technical standards and to assist students in meeting such standards, including preparation for high skill, high wage, or high demand occupations in current or emerging professions" (Carl D. Perkins Career and Technical Education Act, 2006, p. 2).

A part of the Act was that eligible agencies are required to submit a Consolidated Annual Report (CAR) that included "Student attainment of career and technical skill proficiencies, including student achievement on technical assessments, that are aligned with industry-recognized standards, if available and appropriate" (Carl D. Perkins Career and Technical Education Act, 2006, p. 15). The assessments of occupational skill attainments are expected to meet the Perkins "Gold Standard." This is a reference to:

> A classification of technical skill assessments that the U.S. Department of Education, Office of Vocational and Adult Education, views as the most valid and reliable measurement of technical skill attainment. Specifically, the Gold Standard encompasses (1) technical skill assessments, developed by external, third-party agencies to assess national or state-identified standards (e.g., nationally validated employer/industry and postsecondary cluster standards); (2) national, state, or industry-developed credentialing or licensing exams, typically used to control entry into a profession; or (3) standardized statewide assessments of technical skills created by state administrators for local agency use. (DTI Associates, 2007, p. 5)

Statement of the Problem

Even before the passing of the Carl D. Perking Vocational Act in 1963, Pennsylvania supported a loosely organized system of student occupational competency testing (Walter, 1984). With the Act, more students were enrolled in vocational programs that demanded a more organized system of assessing competency (Walter & Kapes, 2003). In 1966, two one-day conferences were held at Rutgers University to discuss the challenge of certifying the non-degreed teacher in the vocational education field. It was determined that there should be a development and implementation of occupational competency examinations on a nationwide basis. These conferences, partially funded by the New York State Education Department and the US Office of Education, Research Bureau, attracted 23 state representatives. Far too long had states struggled with this problem as individuals. The Rutgers's Conference fused professional attitudes and the determination to move collectively in resolving the question of developing and administering adequate measuring instruments. Thus the stage was set for a national thrust in the area of occupational competency testing. It had become quite clear from the Rutgers's conferences that state officials and their departments were neither equipped neither to develop new examinations nor to keep old ones up-to-date. It was generally agreed that printing, distributing, administering, and scoring of examinations imposed an impractical burden on limited state resources. They also expressed ardently that a third-party, nationally coordinated effort was needed to develop occupational competency examinations, in order for honest validation, establishing reliability, and other necessary construct measures. Most importantly,

even the leading test development states were unable to experiment or carry on essential research, test development, field-testing, continuous revision, giving feedback to the states, and providing important test results and comparative, qualitative data. It was clear there was a need to professionally coordinate national efforts through a voluntary consortium effort (National Occupational Competency Testing Institute, 2007).

An initial grant from the US Commissioner of Education through the Bureau of Research titled *Occupational Competency Testing: Consortium of States Project* was awarded to Rutgers University. Subsequent grants lead to the creation of the National Occupational Competency Testing Institute as a permanent organization to serve the Consortium and Institute membership, including legal incorporation with Constitution, by-Laws, and Operating Policies. These activities included movement from Rutgers, through the Educational Testing Service in Princeton, NJ in 1973; through Ferris State University in Big Rapids, MI in 1983; to their own headquarters in Big Rapids, MI. Now NOCTI also owns a newly formed the Whitener Group, a for-profit subsidiary that provides a variety of assessment services for business and industry.

Over its 30 years of continuing development, NOCTI has become a leading provider for occupational competency end-of-program assessments and services (NOCTI, 2007; Munyofu, 2007). By joining NOCTI, Pennsylvania gained the benefits of the national effort to produce quality occupational competency testing instruments to determine job-readiness among graduates of career and technical education programs. These tests were norm-referenced. Member states had the flexibility to choose how they interpreted the test results. Pennsylvania's initial choice was to identify students who performed at or above the national norm. These students were at that time considered as having distinguished themselves. They were awarded the governor's Pennsylvania Skill Certificate. Several unanswered questions remained. How did one know that an individual among the top half of those tested was good enough to be hired?

Among the peripheral effects of the No Child Left Behind legislation of 2001 was a need for states to establish different levels of performance on student measures. Pennsylvania chose levels that aligned with their PSSA assessment.

1) *Advanced Level* – This level reflects mastery of competence and understanding of academic/career and technical skills and knowledge required for advanced placement in employment and/or postsecondary education.
2) *Competent Level* – This level reflects a solid acquisition of academic/career and technical skills and knowledge required to enter employment and/or postsecondary education.
3) *Basic Level* – This level reflects an adequate attainment of academic/career and technical skills and knowledge required to enter employment or postsecondary education. Students with this score would function at an entry level, but would require some assistance on the job.
4) *Below Basic Level* – This level reflects a partial acquisition of skills and knowledge needed to perform a given assignment, task or operation on the job. Additional instruction and/or assistance are necessary in order for the student to successfully complete specific assignments. Students with this score did not acquire the minimum skills required for the occupation.

The specific questions that were to be answered through this study are as follows:

a) How does one know that an individual among the top half of those tested was good enough to be hired?
b) How does a prospective employer know that a student will be competent for

employment?

c) Is there a statistically significant difference in the minimum expectations of competent workers between industry representatives and career and technical education instructors?

Methodology

Selection of Methodology

In 2002, at the recommendation of Kapes (2001), Pennsylvania decided to move from norm-referencing to a criterion-referenced establishment of cut-scores that would lead to a categorization of candidates into one of the four levels of performance on the Job-Ready tests. Among the alternative content methodologies proposed were Nedelsky (1954), Angolf (1971) and Ebel (1972). With a comparison of the various methods available and outlined in Walter and Kapes (2003) article *Developing a Procedure for Establishing Cut Scores*, the Department chose the Nedelsky method because of its intuitive approach and easy implementation.

Selection and Training of Participants

Subject matter experts were selected from throughout the state among career and technical education teachers and craft advisory committees. Other panelists were invited from industry practitioners who customarily employed entry-level workers from high school graduates. Each panel consisted of 12 to 15 members, with a minimum of six instructors and a minimum of six industry representatives. A total of 240 participants consisted of 112 instructors and 128 industry representatives. The assembled panels were introduced to the Nedelsky method through training that included a pretest.

The pretest contained eight items drawn, with permission, from the on-line practice test for the written portion of the driver's license examination prepared by the Pennsylvania Department of Transportation (2002). The panel members were instructed to draw a diagonal slash through the alternatives that a minimally competent driver, typically a 16- or 17-year old student finishing a driver education course, should be able to eliminate as a distracter in their process of selecting the correct answer. Since the pretest contained four items with five choices, three with four choices, and one with two choices, it facilitated a demonstration of the reciprocal calculations, as well as application of the minimally competent criterion. A brief group discussion to double-check the panel members' understanding of the process was conducted subsequent to their independent completion of the evaluation of the pretest. Based upon that discussion, two conclusions were drawn: the process of eliminating alternative responses based upon the concept of a minimally competent worker was well-understood by the members of the panel, and requiring each panel member to calculate the reciprocal values was not useful and was therefore eliminated. Instead, the researchers performed the calculations after all data were collected" (p.8).

Implementation of the methodology

The members of the panel of experts were provided with copies of the respective NOCTI written tests without any indication of the correct responses. They were instructed to draw a diagonal slash through the letter of the alternate responses for each that could be eliminated as a distracter by a minimally competent worker. All written NOCTI test items had 4 choices. An item difficulty value was calculated as the reciprocal of the number of choices not crossed out. A basic concept of the Nedelsky method is: how many choices can the candidate eliminate before resorting to guessing on the rest of the choices? When no choice is eliminated the candidate has a

probability of guessing an answer correctly as 1 out of 4, hence *p*-value = 0.25. When 1 choice is eliminated, that probability is 1 in 3 or $p = 0.33$. Eliminating 2 choices leads to $p = 0.50$. When 3 choices are eliminated $p = 1.00$. The sum of the reciprocals over all the test items denoted the probable passing percent score for a single judge. The average over all the judges is the percent cut score for the test. No additional adjustments were made to this cut score. This is in contrast to the cut score determination at the experienced worker level where the group mean scores are adjusted by subtracting twice the standard error of measurement (Kapes & Welch, 1985; Walter & Kapes, 2003).

Supplemental Survey

At the conclusion of the activity, the research team interviewed the instructors on what they thought about the benchmarking process. They were asked two open-ended questions. First, were your decisions in any way influenced by the make up of your students? Second, what proportion of your students has Individualized Educational Programs (IEPs)?

Results

Table 1 contains the reciprocal values for each of the judges for one test: Job-Ready Precision Machining. For each item, the mean item difficulty as determined by the two groups is identified on the right under the column Mean Industry and Mean Instructor respectively. These means range from 0.25 (where all judges failed to eliminate any answer choices) to 1.00 (where all the judges were able to eliminate 3 distracters). The item difficulty values for the industry representatives had a mean of 0.62 with median 0.59. The values from instructors were 0.57 and 0.56 respectively. From the 171 items on the test, 39 were unanimously ranked at 1.000 among industry representatives. For only 2 of those items did the instructors also rank them as 1.00. There were no other items ranked at 1.00 by all instructors. The judges' individual test total and mean are given at the bottom of the table. The industry representatives' individual test means had a minimum of 0.65 and a maximum of 0.90. In contrast the teachers' test mean were from 0.34 to 0.77. The overall combined mean from all judges was 63.25.

Table 1
Judges' Raw Score Item Difficulty on Precision Machining Written Test

NOCTI CUT SCORES FOR STUDENT WRITTEN EXAMS Precision Machining (Comparison of Judges)									
Item	J 2 (Ind.)	J 3 (Ind.)	J 7 (Ind.)		J 1 (Instr.)	J 4 (Instr.)	J 15 (Instr.)	Mean Ind.	Mean Instr.
1	1.00	1.00	1.00	.	0.33	1.00	1.00	1.0000	0.6550
2	1.00	1.00	0.50	.	0.50	0.50	0.33	. 0.8750	0.6038
3	1.00	1.00	0.50	.	1.00	0.33	0.50	. 0.8750	0.5613
4	1.00	1.00	1.00	.	1.00	1.00	0.50	. 1.0000	0.7288
5	1.00	0.50	0.33	.	1.00	0.50	1.00	. 0.7075	0.6038
6	1.00	0.25	0.33	.	0.33	0.33	0.33	. 0.5200	0.3938
7	1.00	1.00	1.00	.	1.00	0.50	0.50	. 1.0000	0.6038
8	1.00	1.00	0.50	.	0.50	1.00	0.50	. 0.8750	0.5413
9	1.00	1.00	1.00	.	1.00	0.50	0.50	. 1.0000	0.8125
10	1.00	1.00	1.00	.	0.50	0.50	0.50	. 0.8750	0.5625
11	0.50	1.00	0.33	.	1.00	0.33	0.25	. 0.7075	0.6138
12	1.00	0.50	1.00	.	0.50	0.33	0.33	. 0.8750	0.5200
13	0.25	0.25	0.25	.	0.33	0.33	0.33	. 0.2500	0.3738
14	1.00	1.00	1.00	.	1.00	1.00	0.50	. 1.0000	0.8538
15	1.00	1.00	1.00	.	0.50	0.33	0.33	. 1.0000	0.4988
16	1.00	0.25	0.50	.	0.25	0.25	0.25	. 0.6875	0.2813
17	0.25	0.25	1.00	.	1.00	0.25	0.33	. 0.6250	0.5513
18	0.25	0.50	0.25	.	0.50	0.50	0.50	. 0.5000	0.5938
19	1.00	1.00	1.00	.	0.50	1.00	0.50	. 1.0000	0.6875
20	1.00	0.50	1.00	.	1.00	0.50	0.33	. 0.7500	0.5613
21	0.25	0.25	0.50	.	0.50	1.00	0.50	. 0.3125	0.5000
22	1.00	1.00	1.00	.	0.50	0.50	0.33	. 1.0000	0.6450
23	0.25	0.33	0.50	.	0.25	0.25	0.25	. 0.3950	0.4375
24	0.25	0.33	0.50	.	0.50	1.00	0.50	. 0.5200	0.5413
25	0.25	1.00	1.00	.	0.25	1.00	0.25	. 0.8125	0.6250
26	0.25	0.25	1.00	.	0.25	0.50	0.50	. 0.4575	0.5000
27	0.50	0.50	0.25	.	0.50	1.00	0.50	. 0.5625	0.5413
28	1.00	0.25	0.25	.	0.25	1.00	1.00	. 0.6250	0.5313
29	1.00	0.50	0.50	.	1.00	1.00	0.50	. 0.7500	0.6663
30	0.25	0.25	1.00	.	0.25	0.33	0.50	. 0.6250	0.3850
31	0.25	0.25	0.25	.	0.25	0.25	0.25	. 0.2700	0.2813
.	.	.	.	.	.	.	.	. .	.
171	1.00	0.50	0.50	.	0.33	0.33	0.33	. 0.7500	0.4775
Total	153.33	111.97	110.49	.	91.04	107.35	80.51	. 130.10	97.19
Mean	0.90	0.65	0.65	.	0.53	0.63	0.47	. **76.08**	**56.84**

Table 2 contains the results from the test Job-Ready Early Childhood Care and Education with 193 multiple-choice items. The item difficulty values range from 0.2600 to 1.00 for industry representatives, with a mean of 0.62 and median of 0.59. They range from 0.26 to 1.00 for instructors, with a mean of 0.57 and median of 0.55. The total test cut scores for industry were from 0.47 to 0.77. The corresponding scores for instructors were 0.41 to 0.73

Table 2
Judges' Raw Score Item Difficulty on Early Childhood Care and Education Written Test

Test Item	J 1 (Ind.)	J 3 (Ind.)	J 9 (Ind.)		J 2 (Instr.)	J 12 (Instr.)	J 14 (Instr.)		Mean (Ind.)	Mean Instr.
1	1.00	0.33	1.00	.	0.50	1.00	0.50	.	0.8225	0.6667
2	0.33	0.33	0.25	.	0.33	0.50	0.25	.	0.3413	0.3733
3	0.50	0.33	1.00	.	1.00	1.00	0.33	.	0.6450	0.8050
4	1.00	0.33	1.00	.	0.50	1.00	0.25	.	0.9163	0.7917
5	1.00	1.00	0.25	.	1.00	0.50	0.33	.	0.7813	0.6100
6	0.33	0.33	0.33	.	0.33	0.33	0.33	.	0.3300	0.3583
7	0.50	0.33	0.50	.	0.33	1.00	0.33	.	0.4050	0.4983
8	0.50	0.50	1.00	.	0.50	1.00	1.00	.	0.6038	0.6933
9	0.50	0.33	0.33	.	0.33	0.33	0.33	.	0.4775	0.3583
10	1.00	0.50	0.50	.	1.00	1.00	0.50	.	0.5625	0.6667
11	0.33	0.33	0.33	.	0.25	1.00	0.33	.	0.4138	0.5683
12	0.50	0.50	1.00	.	1.00	1.00	0.25	.	0.7075	0.7917
13	0.50	0.33	0.33	.	0.25	0.33	0.50	.	0.4675	0.3600
14	0.33	0.33	1.00	.	0.25	0.25	0.25	.	0.4775	0.4300
15	0.50	0.33	0.50	.	0.50	1.00	0.33	.	0.4575	0.4700
16	0.50	1.00	0.33	.	0.50	0.50	0.33	.	0.5513	0.5267
17	1.00	1.00	0.25	.	1.00	1.00	0.25	.	0.9063	0.7917
18	0.33	0.33	0.50	.	0.50	0.50	0.33	.	0.3725	0.4150
19	1.00	0.33	0.50	.	1.00	1.00	1.00	.	0.6663	0.6933
20	0.25	0.50	0.50	.	0.50	0.25	0.25	.	0.4688	0.4167
21	0.50	0.50	1.00	.	1.00	0.33	0.33	.	0.5400	0.4983
22	0.33	0.50	1.00	.	1.00	0.50	0.25	.	0.6663	0.5000
23	0.33	0.33	0.50	.	1.00	1.00	0.25	.	0.4150	0.5400
24	0.25	0.33	1.00	.	0.25	0.25	0.25	.	0.4988	0.3467
25	0.50	0.33	1.00	.	0.25	0.25	0.33	.	0.7604	0.3317
26	1.00	0.50	1.00	.	0.50	0.50	0.50	.	0.6875	0.5000
27	0.33	0.33	0.33	.	1.00	0.50	0.33	.	0.4150	0.5267
28	0.33	0.33	0.50	.	0.25	0.50	0.33	.	0.3950	0.3733
29	1.00	1.00	0.25	.	1.00	0.25	0.25	.	0.8125	0.5417
30	0.50	0.50	1.00	.	0.50	0.33	0.25	.	0.5625	0.3600
31	1.00	0.33	1.00	.	1.00	0.50	0.33	.	0.7913	0.7217
.	.	.	.	.	.	.	.	.	.	.
193	0.50	0.33	0.50	.	0.33	0.50	0.33	.	0.3738	0.3583
Total	109.08	90.53	149.28	.	115.20	140.75	78.66	.	119.30	110.68
Mean	0.57	0.47	0.77	.	0.60	0.73	0.41	.	**61.82**	**57.35**

Table 3 contains the mean test difficulty cut scores determined separately for industry representatives and instructors of all 17 NOCTI tests benchmarked at that time. It also contains levels of significance for the difference between the two respective means, along with the correlation coefficient between the two types of judges. There was a significant difference in the mean test cut scores for 10 of the 17 tests (at $\alpha = 0.05$).

Table 3
Comparative Data on Mean Cut Scores for Selected NOCTI Written Tests

Test Title	Industry Mean	Instructor Mean	Significance	Correlation
Advertising and Design	60.99	57.07	0.56	.66
Automotive Technician	52.52	49.52	.06	1.00
Building Construction Occupations	73.60	54.69	6.01E-27	.42
Business Information Processing	69.17	61.32	2.60E-8	.56
Carpentry	51.90	51.81	.94	.47
Commercial Foods	86.47	63.17	6.01E-27	.42
Computer Technology	51.44	51.91	.96	1.00
Cosmetology	47.23	56.17	1.01E-8	.68
Early Childhood Care and Education	61.82	57.35	3.46E-6	.70
Electrical Occupations	61.12	50.05	1.83E-23	.69
Food Production	76.62	71.37	1.98E-5	.16
Graphic Communications	62.68	62.14	.80	.31
Nurse Assisting	67.63	65.85	.24	.68
Precision Machining	76.08	56.84	1.26E-33	.54
Production Agriculture	64.75	48.99	4.7E-26	.57
Retail Trades	73.63	72.24	.28	.57
Welding	54.56	64.39	4.82E-12	.34

Secondary Analyses

A review of the answers to the supplemental questions revealed that out of 112 instructors 46 of them indicated that their decisions were not influenced by the students. The rest stated that in spite of the instructions and the training, their decisions were indeed influenced by the make-up of their students. The most common reference was to a high number of students who possessed individualized educational program protocols. The average proportion of such students with IEPs was 40%, with a minimum of 5% and a maximum of 75%.

Discussion

It is evident from the data that instructors, in general, tended to set a lower predicted cut score than their industry counterparts. Of the 17 tests initially benchmarked using the Nedelsky method, 10 were found to show a significant difference in performance expectations from minimally competent workers entering the workforce. In spite of detailed training, along with periodic reinforcements during the benchmarking process, many instructors were influenced by their own students. For a long time career and technical education was a dumping ground for students who were characteristically educationally-challenged. Because they had no intention to go on to postsecondary education, they were channeled into some trade and taken out of the mainstream academic regimen. Now, under the Perkins Act of 2005, all students who finish an approved career and technical education program are expected to be ready for college and work. There were some instructors who had suggested during their interviews that NOCTI tests were outdated, showing little relevance to the present status of industry. Yet all the 17 tests benchmarked at that time were no more than 2 years old. Some were new and had only a year earlier been piloted. During the pilot stage, items that were deemed inappropriate were

expunged. These instructors later had opportunities to work with NOCTI as subject matter experts and participate in test revision. Many instructors found these activities valuable.

Recommendations

Many instructor judges were influenced by the type of students they encountered in their classrooms and laboratories. Indeed there had been a general notion that academically-challenged students were routinely counseled into occupational training they deemed less demanding. Many instructors said that there were high percentages of students enrolled in career and technical education who were not likely to master more than a small fraction of the competencies associated with the program. Their truncated regimen is outlined in the Individualized Education Program (IEP) as prescribed by Part B of the Individuals with Disabilities Education Act (IDEA). Perkins IV has stressed the importance of wedding career and technical education with rigorous academics. It is the expectation that all students who complete career and technical education programs be prepared for postsecondary education and work. If United States graduates are to remain globally competitive, they will need to stay on the cutting edge academically and technologically. It is therefore recommended that instructors engage industry employers, advisory committee members, academics teachers and students in developing and stressing high standards.

The Nedelsky method is an efficient benchmarking process well suited to NOCTI tests. When a completely described criterion is given, such as minimally competent for entry-level employment, the NOCTI tests can acquire more utility that is currently missing. It is recommended that NOCTI employ this methodology to develop national benchmarks with the help of larger panels of subject matter experts selected from all industry and across the country. Some critics, within Pennsylvania and without, have claimed that NOCTI assessments are relatively unknown, to the extent that a Skill Certificate carries little or no weight when its holder offers it as evidence of competency for employment. Yet those familiar with NOCTI know of the vast array of services that the organization provided to their clients. The data contains individual, class, school, state and national information that can be used to evaluate and improve career and technical education programs. Even before administration of the tests, NOCTI provides schools with teacher guides and study guides to help improve their students' performance. It is therefore recommended that NOCTI launch a vigorous campaign to publicize NOCTI and its tests and services, both online and in print.

NOCTI and other occupational assessments have done much to advance career and technical education at the secondary level. NOCTI also provides assessments for experienced workers and for potential teachers. Conspicuously missing is a postsecondary component. This would address those individuals who might seek associate or baccalaureate degrees before entering the workforce. At the time of writing this article, few valid and reliable occupational tests exist that are aligned with industry standards at the postsecondary level. It is therefore recommended that NOCTI develop tests that fill the gap and attain the Perkins gold standard of assessing technical skill attainment in career and technical education at all levels.

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