



## The U.S. Skills Gap

### It's Not All Education's Fault: *An Employer Movement is Critical*

The national conversation about the skills gap has focused almost exclusively on education being both the problem and the solution. The Gates Foundation's postsecondary success strategy, the Lumina Foundation's four year plan to increase the percentage of Americans holding "high-quality degrees and credentials" to 60 percent by 2025, and the Obama Administration's Race to the Top Initiative, all invoke education as the means to ensure fuller employment, particularly of our youth.

The education-to-employment transition, however, involves **two** parties, and only one of them is education. We contend that, in fact, employers' own hiring methods are contributing to the U.S skills gap. By casually defaulting to "a paper degree" as a prerequisite to hiring, employers are requiring all youth go through a specific, 2, 4, or 6 years-long process that is onerous and expensive – and even unattainable for many. At the same time, employers do not measure or enforce any underlying attributes of the graduate. Employers are specifying the process, rather than the product, with significant consequences.

Figure 1 shows skill level (in Applied Mathematics), vs. level of education. Graphs for other skills<sup>1</sup> are nearly identical. When employers hire by degree, they are in fact hiring an enormous swath of aptitudes (pink band) despite nominally similar credentials.<sup>2</sup> This is the origin of employers' complaints that they "can't find the right people." Many bachelor's and master's degree holders (16 and 17 years of education) exhibit applied math skills that are below-average for high school students. Meanwhile, many high school students demonstrate skills that are at the top of the range for college and graduate school. Only when employers hire by skill (blue band), do they ensure they get the level of skill they expect. In practice, this means requiring assessments of job candidates, similar to colleges' requirements of SAT or ACT scores prior to admission decisions.

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<sup>1</sup> ACT has found, via jobsite profiling, that over 16,000 jobs can be defined in terms of 3-6 skills: Applied Mathematics, Reading, Locating Information (ability to understand and apply charts, graphs, and diagrams), Observation, Listening, Writing. We have scatterplots for 4 of these skills; all have similar variance issues.

<sup>2</sup> The enormous scatter means "years of education" correctly predicts only 10% of an individual's applied math skill ( $r^2 = 0.1$ ).

## Impact of Skills-Based Hiring on Education

One or more solid hiring metrics set by employers would shellshock education – in a good way. Innovate+Educate envisions an ecosystem where hiring is based on an unambiguous, clear, performance assessment(s) that could be taken anytime, anywhere. In this paradigm, anyone – whether they be educated through MOOCS, through 20 years of on-the-job-training, through military service, through self-study, or traditional formal education – could instantly demonstrate they had the right skills for the job, thereby opening up all forms of alternative learning as valid currency in the job market (Figure 2).

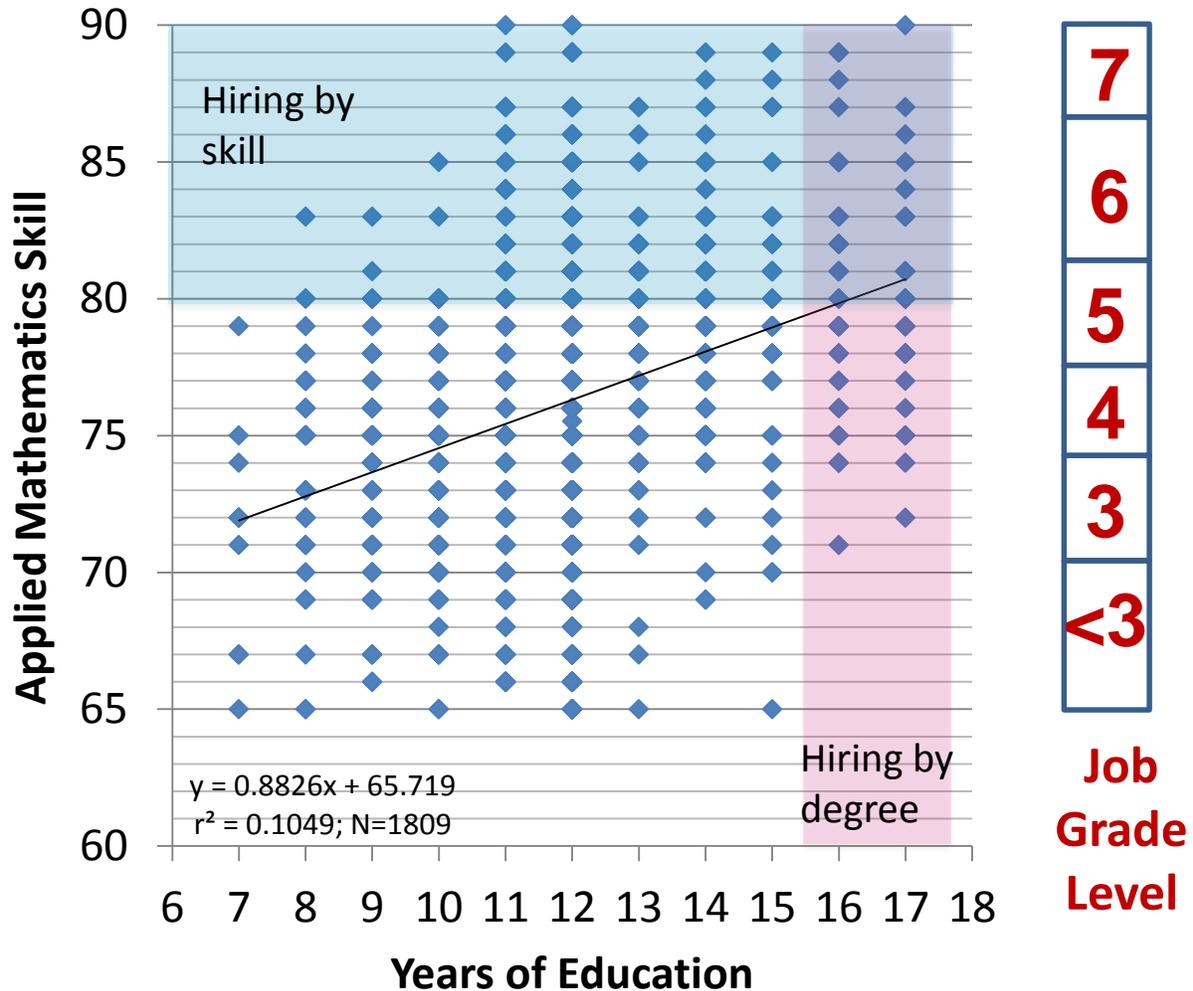


Figure 1. Applied mathematics skill vs. years of education, showing the incredible spread in skill levels for a given level of education. Individuals at grade 12 are high school graduates, grade 16 are college graduates, and grade 17 are master’s degreed and above. The “level” scale on the right hand side of the graph is the coarser scale corresponding to the applied math requirements of real jobs. Most entry-level jobs require a Level 3 in applied math. Level 7 jobs require math at much higher levels and include most science & engineering occupations. Of the 16,000 jobs profiled to date, none require applied math below level 3, though a number of individuals reside at the “<3” level. These individuals are sub-numerate. Data are from 1809 individuals tested in New Mexico.

## CURRENT MODEL: EMPLOYERS Specify PATH

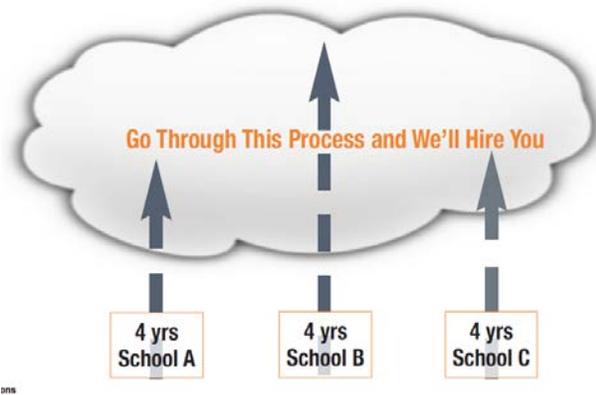


Figure 2A. In the current hiring model, employers require successful candidates to have a degree, thereby defining the specific path individuals must take to obtain a job.

## NEW MODEL: EMPLOYERS Specify GOAL



Figure 2B. In skills-based hiring, employers instead specify an absolute skill level the candidate must possess. This allows candidates to choose any valid learning path that takes them to that goal.

Today, many alternative forms of learning lie on the fringe of social acceptability because they hold no sway in employer hiring decisions and thus have no market value. Many of the populations who would benefit most from these educational interventions, find them of no practical use. This would change, when all real learning can be independently validated and instantly converted to job opportunity.

### You Get What You Measure – So Employers Need a Measure

But what should employers use as the measure of quality – what should constitute the skill “bar” in Figure 2B? The ideal measure(s) would be concrete/numerical, explicit, accurate, *independent* of a degree, and highly predictive of future on-the-job performance. In fact, the metric needs to be significantly better at predicting on-the-job performance than a degree, or there is no incentive for employers to change hiring paradigms. To drive changes in behavior all the way down the supply chain, to job applicants and thence to education providers, the new metric’s use would also need to be widely publicized.

As it turns out, at least one concrete, predictive hiring metric does exist. It has existed, buried in the industrial psychology literature, for over 40 years. Approximately 1000 studies<sup>3</sup> in that literature confirm that an ability composite predicts on-the-job performance literally 5 times better than a degree. The ability composite is, in fact, superior to every other common selection method currently used for hiring<sup>4</sup> (see Table 1).

<sup>3</sup> A sampling of such studies is given in Appendix A.

<sup>4</sup> Structured behavioral interviews, which became prominent after the work described in Table 1 was published, come very close to the predictive validity of cognitive skills. However, they are a time-intensive process, involving hours of one-on-one interaction with each candidate and are not easily scalable.

**Table 1.** Table from the metastudy by Hunter and Hunter<sup>5</sup> (1984). On the left are listed various employer hiring metrics. The mean correlation coefficient, M, for each metric describes how well it correlates to future on-the-job performance (measured primarily by supervisor ratings and work product samples). M can vary from 0 to 1. M= 0 means no correlation to on-the-job performance; employers using this method to select candidates might as well be picking names out of a hat. M=1 indicates a perfect correlation to on-the-job performance. No methodology is perfect, but the ability composite is literally 5 times better than level of education (or degree) in predicting future job performance (M=0.53 vs. M=0.1).

<u>VALIDITY</u>				
PREDICTOR	M	SD	NO. OF STUDIES	TOTAL SUBJECTS
<b>ABILITY COMPOSITE</b>	<b>.53</b>	<b>.15</b>	<b>425</b>	<b>32,124</b>
Job Tryout	.44	–	20	–
Biographical Inventory	.37	.10	1	4,429
Reference Check	.26	.09	10	5,389
Experience	.18	–	425	32,124
Interview	.14	.05	10	2,694
Training & Experience Ratings	.13	–	65	–
Academic Achievement	.11	.00	11	1,089
<b>EDUCATION</b>	<b>.10</b>	<b>–</b>	<b>425</b>	<b>32,124</b>
Interest	.10	.11	3	1,789
Age	-.01	–	425	32,124

The ability composite is simply the combined (added or averaged) results of three different standardized cognitive skills tests. Each test measures one’s skill in dissecting and applying a particular kind of information (oral information, written information, visual information, etc.). It turns out the workplace is full of information, and the road to workplace success is not to arrive with yet more information in one’s head, but to be able to interpret, sort, organize, and make sense out of the information that is already out there. It is this information processing facility that is the common step in arriving at a conclusion, developing a product, addressing a customer complaint, or designing a new strategy. Individuals with high levels of cognitive skill are proficient at manipulating information to such an extent, they move from task to task and job to job with high fluidity and high productivity. In short, they are experts at “learning how to learn.”

<sup>5</sup> John E. Hunter and Ronda F. Hunter, “Validity and Utility of Alternative Predictors of Job Performance,” *Psychological Bulletin* **96** (1984), 72-98.

At a national level, these cross-functional skills in critically dissecting and utilizing information are the first prerequisite for a highly adaptive and skilled workforce. In the Internet age, raw content is already out there, for the taking. Labels, such as degrees and job titles, are multiplying like happy rabbits, as fast as new content surfaces. Job performance thus boils down to: Whatever the content, can you learn it? Can you use it?

### The Universality of Cognitive Skills

The modern version of the three-component ability composite has a bit more refinement and looks at up to 6 fundamental skills, but the concept is the same. There are many nuances on what the tests cover (not much overlap with traditional school subjects, despite some similar titles), but they are real and they do work. ACT has profiled over 16,000 jobs by sending experts to corporate worksites and found that over 95% of all jobs can be expressed as a combination of 3-5 fundamental skills. The higher the cognitive load of the job (e.g., a scientist vs. a waiter), the more predictive of job performance cognitive skill scores become (Table 2).

**Table 2.** Cognitive ability predicts on-the-job performance better for higher complexity jobs than lower complexity jobs (Hunter and Hunter, 1984). Note that for the average job,  $M \approx 0.5$ , as stated earlier.

JOB COMPLEXITY	HOW WELL SKILLS TESTING PREDICTS PERFORMANCE (Raw Validity)
(as determined from DOL's "data" dimension in its Dictionary of Occupational Titles)	<b>1</b> = perfect prediction of performance <b>0</b> = zero ability to predict performance
High Complexity	.58
Medium Complexity	.51
Low Complexity	.40
Unskilled	.23

### Impact of Skills-Based Hiring on Employers

In our view, the most convincing proof that skills-based hiring can close the skills gap comes from the companies themselves. As Table 3 shows, those companies who have begun to use "skills-based hiring" to select job candidates have seen incredible performance improvements: 25-75% reductions in turnover, 40-70% reductions in time-to-hire, 70% reductions in cost to hire, 50% reductions in time-to-train, and various other benefits that vary according to industry sector (e.g., up to an 80% reduction in the cost of non-conforming product for manufacturing companies). Instead of just getting anyone who has a piece of paper of some kind, from somewhere, they get someone who can do the job. This distinction matters.

**Table 3.** Case Studies of Employers Using Cognitive Skill Scores as a Hiring Criterion

Employer	Positions Filled Using Cognitive Skill Scores	Outcomes (compared to prior practices)
<b>Subaru of Indiana Automotive</b> (Lafayette, IN)	Automotive assembly workers	25% reduction in turnover.
<b>Covidien Health Care</b> (Macon, GA)	Manufacturing production	Per-person hiring cost reduced from \$2,300 to \$600 Time-to-hire reduced from 45 days to 17 days. Time-to-full-employee efficiency reduced from 2 years to 6 months.
<b>Steelscape</b> (Calama, WA; Richmond & Rancho Cucamonga, CA)	Self-directed manufacturing teams	<4% turnover overall and a “Best Practice” award from the American Psychological Association for its hiring process.
<b>Bradner Village, a retirement community</b> (Marion, IN)	Nurses, nursing assistants, dietary staff, etc.	37% reduction in turnover.
<b>Inova Health System</b> (Falls Church, VA)	Customer assistants & clinical technicians	73% reduction in turnover; \$1.8M cost savings.
<b>911 call center</b> (Lexington county, SC)	Call center operators	50% reduction in turnover; skills-related turnover went to 0.
<b>Berner Food and Beverage</b> (Dakota, IL)	Food production	95% reduction in worker’s compensation. 80% reduction in cost of nonconforming product. Longest run to date without a lost-time injury. Turnover now down to 2%.
<b>Farmington Public Library</b> (Farmington, NM)	Library Clerk	Cost-to-hire reduced 70%; time-to-hire reduced 60%. Applicant pool trimmed by 78%.
<b>Buckman Regional Water Treatment Plant</b> (Santa Fe, NM)	All positions within the company.	0 turnover after one year.
<b>PGT Industries</b> (Salisbury, NC and Venice, FL)	Manufacturing, glass processing, and logistics	30% reduction in turnover; 50% reduction in training costs; 50% reduction in training time
<b>Energizer</b> (Asheboro, NC)	Production operators, electricians, equipment mechanics, anode room operators.	Skills-related turnover is now 0.
<b>CG Power Systems</b> (Washington, MO)	17 different positions	Turnover <3%.

The case studies themselves can be found at <http://www.act.org/workforce/case> and <http://www.newoptionsnm.info/employers.php> (under the Employer Case Studies heading)

### Impact of Skills-Based Hiring on Jobseekers

Skills-based hiring dramatically improves corporate bottom lines. But, what does it do for the jobseeker? Because learning really does exist in many forms, and not just in the form of a paper degree, many, many more individuals stand to be qualified for jobs if an independent assessment is made of their skills. Our analysis of 3505 unemployed 16-24 year olds in New Mexico showed that while only 1% had college degrees (the probable root cause of their being unemployed in the first place), fully 33% tested out as having the *skills* equivalent to a college graduate. Somehow these individuals had accumulated their cognitive skills through other venues – life, work, or maybe just paying better attention in high school than their peers. Being able to demonstrate these skills, through 3-5 hours of testing, would save these individuals a lifetime of moving fruitlessly from entry level job to entry level job, when they are capable of so much more.

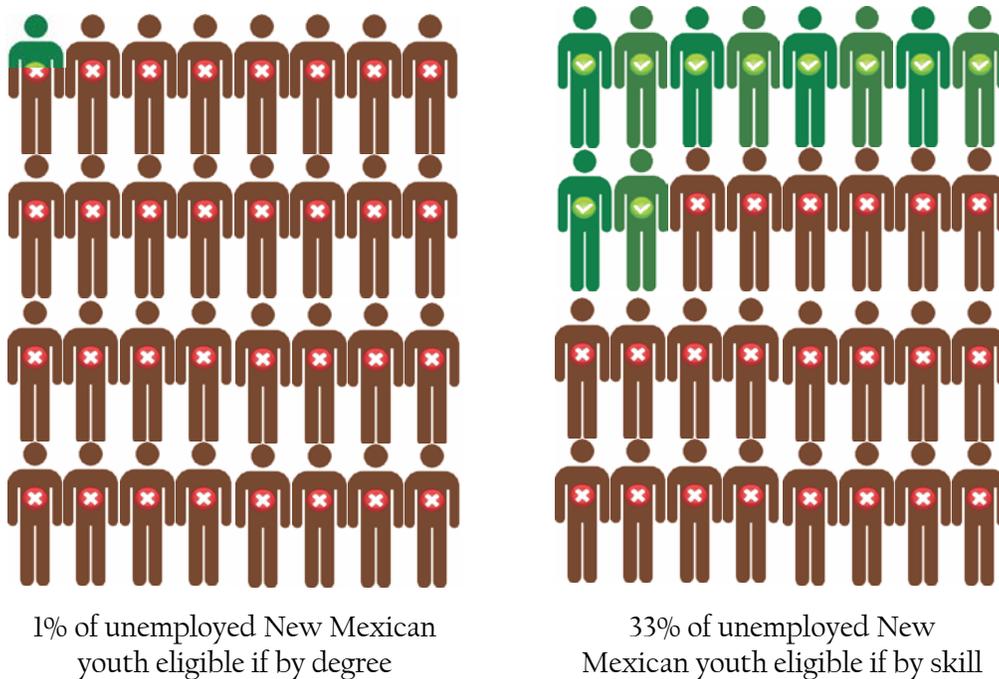


Figure 3. Impact of skills-based hiring on job placement, for jobs requiring a college degree.

### “Skilling Up” - Teaching Cognitive Skills, Explicitly

One fly in the ointment remains – what do we do about people who really don’t have appropriate cognitive skills? Yes, we are able to show that 33% of unemployed New Mexican youth have the skills to perform jobs requiring a college degree, but 66% do not. And, for these individuals, “more school” really isn’t the answer. At least, not “more of the same” school. The equation in Figure 1 shows that years of school explains only 10% ( $r^2=0.1$ ) of an individual’s cognitive skill in Applied Mathematics; the same is true for other skills like Observation or Reading or Locating Information (ability to comprehend and use charts, graphs, and diagrams). School does increase cognitive skills (the line in Figure 1 goes

up), but very slowly (low slope) and very inefficiently (large amounts of scatter around the line), because school is not designed to explicitly teach these skills.

Nevertheless, these skills can be taught, and quickly. We obtained data from a workforce center in California that had been using a skills-centric curriculum<sup>6</sup> and found that it took about 72-96 hours of full-time study to advance from the cognitive skill levels associated with entry level jobs (Level 3), to the skill levels associated with blue or pink collar jobs (Level 4). Another 72-96 hours takes one to the skill levels associated with white collar jobs (Level 5). Thus, there is a solution, and it is fast enough and effective enough to be administered as a “shot in the arm” – e.g., a summer course or single year-long class – during the longer tenure of traditional formal education. In a skills-based ecosystem, the companion to skills-based hiring is skills-based training. Education still plays a vital role, though much work remains to be done in developing an optimal integration of skills training into traditional curricula and intervention efforts.

### **Building a Skills-Based Ecosystem - Together**

In our New Mexico work, we advocate employers not only publicize their desired skill scores right on their job postings, but also provide, on the same job posting, a direct link to the online training curriculum that helps people acquire those scores. When enough employers do this, the message becomes clear: these skills are important, you need to acquire them, and this is how you do it. And, by the way, we won't hire you without them. This is the demand side (employer) pull we feel is an absolutely necessary complement to the supply-side (education) push, if we want to close the U.S. skills gap.

As a result of employers' re-articulated job postings, over 1300 New Mexican jobseekers a month take hours-long voluntary skill assessments – and, where necessary, “skill up.” By communicating their expectations far more directly and explicitly than ever before, and by reinforcing the talk with concrete action, namely, changing their own hiring practices, employers are doing their part in closing the skills gap.

### **Innovate+Educate: About Us**

Innovate+Educate is an industry-led nonprofit implementing research-based strategies to close the national skills gap and bridge the opportunity divide. We are vertically integrated, taking on the entirety of system change: from national policy and movement-building, to frontier-pushing research, to the development of practical tools and services, to program and service delivery at the community level. Through this aligned effort, Innovate+Educate is creating sustainable ecosystems that prove skills based hiring and training open new pathways for job seekers, benefit employers, and strengthen communities.

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<sup>6</sup> The study used Keytrain<sup>®</sup> as the skills curriculum (Keytrain<sup>®</sup> is a registered trademark of ACT, Inc. For more information please visit <http://www.keytrain.com>) and had a pretest-posttest design. Gains were significant to  $p < 0.001$ . Depending on the skill being evaluated, the number of study participants ranged from 63 (reading) to 218 (locating information).

Our early work in New Mexico was supported largely by the W.W. Kellogg Foundation. Beginning in 2014, we will be nationalizing our skills-based hiring approach. Our next step is to develop the tools needed for replication (physical) and scale (virtual), along with the public relations, marketing, and convening functions necessary to ensure adoption into both policy and practice.

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## Appendix A

Sample of the roughly 1000 citations showing cognitive skills predicts on-the-job performance at an r level of 0.3-0.6. This selection features an assortment of researchers prominent in the field. Googling any of the individual author's names will reveal additional citations.

1. M.M. Olea and M.J. Ree, *J. Appl. Psych* **79**, 845-851 (1994).
2. M.H. Ree, J.A. Earles and M. Teachout, *J. Appl. Psych* **79**, 518-524 (1994).
3. K. Brown, H. Le and F.L. Schmidt, *Intl. J. Selection and Assessment* **14**, 87-100 (2006).
4. Schmidt, Ones, and Hunter, *Ann. Review Psych* **43**, 627-70 (1992).
5. J.E. Hunter and R.F. Hunter, *Psych Bull* **96**, 72-98 (1984) Also: a full decade of papers by Hunter from 1980-1990, covering an enormous number of datasets.
6. K. Pearlman, F.L. Schmidt and J.E. Hunter, *J. Appl. Psych* **65**, 373-406 (1980)
7. F.L. Schmidt, J.E. Hunter, and J.R. Caplan, *J. Appl. Psych* **66**, 261-273 (1981)
8. L.C. Northrup, Validity Generalization Results for Apprentice and Helper-Trainer Positions. Washington, DC: U.S. Office of Personnel Management, Office of Staffing Policy (1986).
9. J.A. Hartigan and A.K. Wigdor, *Fairness in Employment Testing: Validity Generalization, Minority Issues, and the General Aptitude Test Battery*. Washington, DC: National Academy of Sciences (1989).
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11. J.F. Salgado, H. Anderson, S. Moscoso, C. Berta and F. De Fruyt, *Personnel Psych* **56**, 573-605 (2003)
12. H.R. Hirsch, L.C. Northrup, and F.L. Schmidt, *Personnel Psych* **39**, 399-420 (1986).
13. M.H. Trattner, *The Validity of Aptitude and Ability Tests for Semiprofessional Occupations Using the Schmidt-Hunter Interactive Validity Generalization Procedures*. Washington, DC: U.S. Office of Personnel Management, Office of Staffing Policy (1988).