The ASVAB Career Exploration Program: TECHNICAL SUMMARY

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The ASVAB Career Exploration Program is a comprehensive career exploration and planning program that includes three major elements:

A rigorous development methodology and validation process was applied during the creation of the ASVAB, the FYI, and the OCCU-Find. This document provides a summary of the essential background information on the development and validity of each of these program elements.

The ASVAB: Technical Information at a Glance

The ASVAB is one of the most well respected and researched tests in modern history. Literally hundreds of studies have assessed its psychometric and statistical characteristics. Virtually all published reviews of the ASVAB (e.g., Jensen, 1988; Elmore & Bradley, 1994; Rogers, 2001; Patrick, Blasel, & Gross, 2009) support the validity, strong documentation, and technical underpinnings of the ASVAB.

ASVAB Test Descriptions and Scoring

The ASVAB test battery includes eight subtests with a total of 200 items. Students receive both grade-based standard scores and score bands as well as percentile scores for each of the eight tests that comprise the ASVAB. Students also receive Career Exploration Scores expressed as standard and percentile scores. All of these scores and the Student Result Sheet are described in more detail in the Counselor Guide: Empowering Your Students. More detail on the Item Response Theory (IRT) model underlying the ASVAB scoring can be found on the Official ASVAB website.

Rather than use individual ASVAB tests for career exploration purposes, the ASVAB Program relies on the use of specially derived Career Exploration Scores, or composites. The relationship between the individual subtests and the Career Exploration Scores is described in the table that follows.
**Word Knowledge** tests the ability to understand the meaning of words through synonyms—words having the same or nearly the same meaning as other words. The test is a measure of one component of reading comprehension since vocabulary is one of many factors that characterize reading comprehension.

**Paragraph Comprehension** tests the ability to obtain information from written material. Students read different types of passages of varying lengths and respond to questions based on information presented in each passage. Concepts include identifying stated and reworded facts, determining a sequence of events, drawing conclusions, identifying main ideas, determining the author’s purpose and tone, and identifying style and technique.

**Mathematics Knowledge** tests the ability to solve problems by applying knowledge of mathematical concepts and applications. The problems focus on concepts and algorithms and involve number theory, numeration, algebraic operations and equations, geometry and measurement, and probability. Mathematics knowledge is one factor that characterizes mathematics comprehension and assesses logical thinking.

**Arithmetic Reasoning** tests the ability to solve basic arithmetic problems one encounters in everyday life. One-step and multi-step word problems require addition, subtraction, multiplication, and division, and choosing the correct order of operations when more than one step is necessary. The items include operations with whole numbers, operations with rational numbers, ratio and proportion, interest and percentage, and measurement. Arithmetic reasoning is one factor that helps characterize mathematics comprehension and logical thinking.

**General Science** tests the ability to answer questions on a variety of science topics drawn from courses taught in most high schools. The life science items cover botany, zoology, anatomy and physiology, and ecology. The earth and space science items are based on astronomy, geology, meteorology, and oceanography. The physical science items measure force and motion mechanics, energy, fluids, atomic structure, and chemistry.

**Mechanical Comprehension** tests understanding of the principles of mechanical devices, structural support, and properties of materials. Mechanical comprehension topics include simple machines, compound machines, mechanical motion, and fluid dynamics.

**Electronics Information** tests understanding of electrical current, circuits, devices, and systems. Electronics information topics include electrical circuits, electrical and electronic systems, electrical currents, electrical tools, symbols, devices, and materials.

**Auto and Shop Information** tests aptitude for automotive maintenance and repair, and wood and metal shop practices. The test covers several areas commonly included in most high school auto and shop courses such as automotive components, automotive systems, automotive tools, troubleshooting and repair, shop tools, building materials, and building and construction procedures.

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**Table 1. Individual ASVAB Tests and Career Exploration Scores**

<table>
<thead>
<tr>
<th>Individual ASVAB Tests</th>
<th>Career Exploration Scores</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Word Knowledge</strong></td>
<td><strong>Verbal Skills</strong> is a general measure of vocabulary and reading skills covered in the Word Knowledge and Paragraph Comprehension tests. People with high scores tend to do well in tasks that require good vocabulary or reading skills, while people with low scores have more difficulty with such tasks.</td>
</tr>
<tr>
<td><strong>Paragraph Comprehension</strong></td>
<td><strong>Math Skills</strong> is a general measure of mathematics skills covered in the Mathematics Knowledge and Arithmetic Reasoning tests. People with high scores tend to do well in tasks that require a knowledge of mathematics, while people with low scores have more difficulty with these kinds of tasks.</td>
</tr>
<tr>
<td><strong>Mathematics Knowledge</strong></td>
<td><strong>Science and Technical Skills</strong> is a general measure of science and technical skills which are covered in the General Science, Electronics Information, and Mechanical Comprehension tests. People with high scores tend to do well in tasks that require scientific thinking or technical skills, while people with low scores have more difficulty with such tasks.</td>
</tr>
<tr>
<td><strong>Arithmetic Reasoning</strong></td>
<td></td>
</tr>
<tr>
<td><strong>General Science</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Mechanical Comprehension</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Electronics Information</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Auto and Shop Information</strong></td>
<td></td>
</tr>
</tbody>
</table>
**ASVAB Career Exploration Composites**

The Career Exploration Scores or Composites — Verbal Skills, Math Skills, and Science and Technical Skills — were derived through factor analyses of the ASVAB. To verify the presence of the math, verbal, and science and technical factors, both exploratory and confirmatory factor analyses were conducted using the nationally representative data from Profile of American Youth 1997 (PAY97). Both methods yielded similar results and conclusions. More information about the development and validation of the career exploration scores can be found in the ASVAB Career Exploration Program: Theoretical and Technical Underpinnings of the Revised Skill Composites and OCCU-Find.

**Military Composite**

In addition to the individual ASVAB test scores and the Career Exploration Scores, each student receives a Military Entrance Score (AFQT). The AFQT is a composite score based on results from the following four tests: Arithmetic Reasoning, Mathematics Knowledge, Paragraph Comprehension, and Word Knowledge. It is the score used if an individual decides to enter any of the military services.

**ASVAB Forms and Norms**

**Equivalent Forms**

Plans are currently underway to transition all ASVAB testing to online testing (iCAT). Until this transition is complete, pencil and paper versions of the ASVAB will continue to be administered to high school students. Forms 23 and 24 of the ASVAB are the versions that are currently administered in high schools. ASVAB Forms 23 and 24 were equated with the earlier version, ASVAB Form 8(a), as the reference form. The equivalence of different versions of the ASVAB is important so that regardless of which form a student completes, the percentile scores on all test forms can be interpreted in the same way.

Detailed information on the development and equating of current ASVAB forms can be found in ASVAB Technical Bulletin No. 4.

**ASVAB National Norms**

When students take the ASVAB, they benefit from the fact that the ASVAB has established national norms. As previously mentioned, students receive their ASVAB results expressed as both standard scores and percentile scores. These scores indicate how students performed in relation to an age-appropriate, nationally representative sample. These norms enable students to know how their scores compare with a nationally representative sample of youth in their particular grades.

National norming studies for the ASVAB are typically conducted every 15-20 years. The current national norms for the ASVAB were implemented in 2004. The norming sample for the Career Exploration Program (CEP) was 4,700 youth expected to be in grades 10-12 in the fall of 1997. These youths were identified from a screening of over 90,000 housing units, as part of the PAY97 study. In the summer and fall of 1997, the CAT-ASVAB was administered to study participants under standardized conditions. The performance of this reference group was then used to develop new norms for the ASVAB. To learn more about the PAY97 study, click here.

Detailed information regarding the latest ASVAB norms can be found in ASVAB Norms for the Career Exploration Program.

**ASVAB Reliability**

One of the critical technical qualities of a test is its reliability. Reliability is the psychometric property concerned with the accuracy, precision, and consistency of test scores. This consistency can be across time (test-retest reliability), across different forms of the same measure (parallel forms reliability), across items within a single measure (internal consistency), across repeated testing of the same individual (standard error of measure), or across response patterns (item response theory (IRT)-based reliability estimates). Each of these approaches leads to estimates of the reliability of the measure. The reliability estimates of the ASVAB are based on IRT. IRT is a theory that relates observable examinee performance on a test to an unobservable latent trait (i.e., ability) that is assumed to underlie the test. IRT scoring is increasingly being used in many testing programs as an alternative to the computation of raw scores because of its perceived advantages (e.g., increased accuracy in evaluating both examinee ability and quality of test items).

Table 2 presents IRT-based reliability estimates for ASVAB composite scores and test scores computed using responses from students taking the ASVAB during the 2003 school year (July 2003-June 2004). The minimum sample sizes used to compute the reliability estimates across tests and composite scores are also provided. The reliability estimates for the ASVAB composites range from .88 to .91, while the estimates for the individual tests range from .69 to .88. The computation of the IRT reliabilities is discussed in more detail in Computing IRT Reliabilities for the ASVAB Student Testing Program (U.S. Department of Defense, 1999).
ASVAB Validity

One of the central concerns of counselors about testing is whether the tests they use are valid. Validity refers to the appropriateness, meaningfulness, and usefulness of the inferences made from test scores. Most validity studies seem to be conducted to accumulate evidence to assess “the degree to which it [the test] measures what it is supposed to measure” (Rosenthal & Rosnow, 1991, p. 60). Traditionally, the focus on test validation has been on examining validity from three different perspectives: content validity, construct validity, and criterion validity. For a test to be considered a valid measure, there should be evidence to support all three types of validity.

Based on the validity studies that have been conducted, the ASVAB is a valid predictor of successful performance in educational programs and in various civilian and military occupations. Scores from the ASVAB predict success in high school and postsecondary school courses, as well as military occupational training programs. The usefulness of ASVAB scores for predicting entry-level performance in civilian occupations is supported by (a) the abundance of data linking ASVAB scores to military and civilian occupations; (b) analyses linking civilian and military occupations; and (c) the strong relationship between scores on the ASVAB and those on the General Aptitude Test Battery (GATB), a test battery with extensive validity data for civilian workers. In addition, scores from the ASVAB do not systematically underestimate the performance of minority group members or women.

More information regarding the validity of the ASVAB can be found here.

ASVAB Test Fairness

During the development of the ASVAB, active steps were taken to uphold the following credos:

- The tests should not be biased.
- Adverse impact should be minimized.
- Test items should not be offensive to any examinee subgroups.
- Items/tests should perform similarly across racial/ethnic/gender groups that are matched on ability.
- Test items should perform similarly across paper and computer administrations.
- Lack of exposure to testing medium or testing conditions should not adversely affect examinees’ performance.
- Scores should be comparable across administration modes.

For more information about test fairness, click here.

Bias and Differential Prediction

Bias occurs when an item or test unfairly favors one group over another. The occurrence of bias is problematic because it can negatively affect test validity. To ensure that no bias occurs in the ASVAB, all items undergo differential item functioning (DIF) analyses and sensitivity reviews prior to operational use. If an item performs differently for comparison groups that are matched on ability, the item is said to display DIF. DIF is a necessary (but not sufficient) condition for the occurrence of bias. Items showing statistical evidence of DIF undergo an

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Table 2. IRT-Based Reliability Estimates for ASVAB Composites and Tests

<table>
<thead>
<tr>
<th>Composite</th>
<th>Males 10&lt;sup&gt;th&lt;/sup&gt; Grade</th>
<th>Males 11&lt;sup&gt;th&lt;/sup&gt; Grade</th>
<th>Males 12&lt;sup&gt;th&lt;/sup&gt; Grade</th>
<th>Females 10&lt;sup&gt;th&lt;/sup&gt; Grade</th>
<th>Females 11&lt;sup&gt;th&lt;/sup&gt; Grade</th>
<th>Females 12&lt;sup&gt;th&lt;/sup&gt; Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>Verbal Skills</td>
<td>.89</td>
<td>.89</td>
<td>.88</td>
<td>.89</td>
<td>.89</td>
<td>.89</td>
</tr>
<tr>
<td>Math Skills</td>
<td>.90</td>
<td>.91</td>
<td>.90</td>
<td>.90</td>
<td>.91</td>
<td>.90</td>
</tr>
<tr>
<td>Science and Technical Skills</td>
<td>.89</td>
<td>.90</td>
<td>.90</td>
<td>.88</td>
<td>.89</td>
<td>.88</td>
</tr>
<tr>
<td><strong>Subtests</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Science</td>
<td>.79</td>
<td>.79</td>
<td>.79</td>
<td>.78</td>
<td>.79</td>
<td>.78</td>
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<tr>
<td>Arithmetic Reasoning</td>
<td>.82</td>
<td>.84</td>
<td>.83</td>
<td>.81</td>
<td>.83</td>
<td>.82</td>
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<tr>
<td>Word Knowledge</td>
<td>.87</td>
<td>.88</td>
<td>.87</td>
<td>.88</td>
<td>.88</td>
<td>.88</td>
</tr>
<tr>
<td>Paragraph Comprehension</td>
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<td>.73</td>
<td>.73</td>
<td>.74</td>
<td>.73</td>
<td>.74</td>
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<tr>
<td>Mathematics Knowledge</td>
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<td>.84</td>
<td>.83</td>
<td>.84</td>
<td>.85</td>
<td>.84</td>
</tr>
<tr>
<td>Electronic Information</td>
<td>.71</td>
<td>.72</td>
<td>.72</td>
<td>.69</td>
<td>.71</td>
<td>.71</td>
</tr>
<tr>
<td>Auto and Shop Information</td>
<td>.76</td>
<td>.79</td>
<td>.79</td>
<td>.69</td>
<td>.71</td>
<td>.71</td>
</tr>
<tr>
<td>Mechanical Comprehension</td>
<td>.77</td>
<td>.77</td>
<td>.77</td>
<td>.75</td>
<td>.76</td>
<td>.76</td>
</tr>
<tr>
<td><strong>Minimum N</strong></td>
<td>34,317</td>
<td>241,799</td>
<td>77,574</td>
<td>31,251</td>
<td>234,147</td>
<td>64,700</td>
</tr>
</tbody>
</table>

Note. IRT — Item Response Theory
additional content review to remove items that are suggestive of bias. Items also undergo an external sensitivity review by a demographically diverse panel of content experts to delete items that appear potentially biased or insensitive. ASVAB scores are also monitored for the occurrence of adverse impact. Impact occurs when comparison groups that are not matched on ability perform differentially on an item or test. Adverse impact occurs when a comparison group is disadvantaged by those performance differences. The occurrence of adverse impact does not reflect bias if validity research suggests that the test is equally valid for relevant comparison groups (i.e., there is no differential prediction across groups). Prior research on the ASVAB technical tests has shown similar prediction lines across males and females, and across blacks and whites, suggesting no bias and leading the authors to conclude that the ASVAB technical composites were fair for the minority groups studied (Wise, Welsh, Grafton, Foley, Earles, Sawin, & Divgi, 1992). The complete findings of the study can be viewed here.

**ASVAB Reading Level**
The vocabulary and comprehension levels of the ASVAB test questions and directions are well within the range of the target audience which is students in grade 10 or higher. For example, vocabulary words on the Word Knowledge test are often found in books used by high school students and Paragraph Comprehension passages are generally written for a target audience of 10th graders.

**The FYI: Technical Information at a Glance**
The primary purpose of this section is to introduce the Find Your Interests (FYI) inventory, a measure of career and vocational interests designed by the Department of Defense specifically for the ASVAB Career Exploration Program. The FYI is designed to help students learn about their career-related interests. Based on John Holland’s well-accepted theory of career choice, the FYI assesses an individual’s resemblance to each of the six RIASEC (Realistic, Investigative, Artistic, Social, Enterprising, and Conventional) types described by Holland (1997).

**Holland’s RIASEC Theory**
Holland’s (1973, 1985a, 1997) theory of vocational personalities and work environments is the most widely accepted contemporary theory of career choice (Brown & Gore, 1994; Weinrich & Srebalus, 1990) and the dominant model of interest assessment (Armstrong, Allison, & Rounds, 2008). Many consider it to be the dominant model in vocational psychology (Campbell & Borgen, 1999; Gottfredson, 1999; Tracey, 2008). Holland designed the theory to address three important aspects of vocational psychology and career development. He wanted his theory to identify the personal and work environment characteristics that lead to satisfying career decisions, involvement, and achievements. He hoped to find the personal and work environment characteristics that lead to career stability and career change. Finally, he wanted to determine the most effective methods for helping people with career decisions and problems.

Holland states that most people can be categorized in terms of their resemblance to the six model RIASEC personality types: Realistic, Investigative, Artistic, Social, Enterprising and Conventional (see Table 3).

The more closely an individual resembles a particular type, the more likely that person is to exhibit the personality characteristics associated with that type. Holland also suggests that most work environments can be categorized in terms of their resemblance to each of the six RIASEC model environment types. The more closely a work environment resembles a particular type, the more likely that environment is to exhibit the characteristics associated with that type. Different work environments require different skills, abilities, and competencies from those who work in them. As such, work environments call for the types of skills possessed by people with the corresponding personality type. For example, Realistic work environments require people with the competencies associated with the Realistic personality type. Consequently, for each personality type there is a corresponding work environment type, in which their skills, abilities, and competencies are valued. Further, the corresponding work environment becomes a place where a great deal of value is placed on the required skills, abilities and competencies, as well as on the attitudes and interests that spawn them. Therefore, these environments can be categorized in the same way as people are categorized. Similarly, each work environment type has at least some characteristics associated with the other types. Holland (1985, p. 3) argues “the choice of an occupation is an expressive act which reflects the person’s motivation, knowledge, personality, and ability. As such, occupations represent a way of life, an environment rather than a set of isolated functions or skills.”
<table>
<thead>
<tr>
<th>RIASEC Domain</th>
<th>RIASEC Description</th>
<th>Example Occupations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Realistic (R)</strong></td>
<td>Typically prefer work activities that include practical, hands-on problems and solutions, such as designing, building, and repairing machinery. They tend to enjoy working outside, with tools and machinery, or with plants and animals. Realistic types generally prefer to work with things rather than people. Realistic occupations generally require workers to have physical and mechanical abilities.</td>
<td>Anesthesiologist Assistant; Broadcast Technician; Cabinetmakers and Bench Carpenters; Construction and Building Inspector; Cook; Dental Laboratory Technician; Electrician; Firefighter; Forest and Conservation Worker; Security Management Specialist; Transportation Engineer.</td>
</tr>
<tr>
<td><strong>Investigative (I)</strong></td>
<td>Typically prefer analytical or intellectual activities such as reading, studying, investigating, evaluating, and problem solving. Investigative types generally prefer to work with ideas rather than with people or things. Investigative occupations generally require workers to have mathematical and scientific abilities.</td>
<td>Anthropologist; Biomedical Engineer; Dentist; Dietitian/Nutritionist; Chemical, Electronics, and Agricultural Engineer/Technician; Computer Network Architect; Computer Hardware Engineer; Computer Programmer; Forensic Science Technician; Market Research Analyst; Physician/Surgeon; Urban and Regional Planner; Veterinarian.</td>
</tr>
<tr>
<td><strong>Artistic (A)</strong></td>
<td>Typically prefer work that involves expressing oneself in original activities like writing, dancing, singing, sculpting, and painting. They tend to enjoy working in a setting where the work can be done without following a clear set of rules. Artistic types generally prefer to work with ideas rather than things. Artistic occupations generally require workers to have artistic abilities and good imagination.</td>
<td>Actor; Architect; Desktop Publisher; Film and Video Editors; Choreographer; Composer; Graphic Designer; Landscape Architect; Musician; Photographer; Radio and Television Announcer; Reporter/Correspondent; Set and Exhibit Designer.</td>
</tr>
<tr>
<td><strong>Social (S)</strong></td>
<td>Typically like activities that involve personal interaction with people such as teaching, counseling, or otherwise to be of service to others. They prefer work that involves informing, helping, or serving others in either individual or group settings. Social types prefer to work with people rather than to work with objects, machines or data. Social occupations generally require personal interaction and communication skills and abilities.</td>
<td>Athletic Trainer; Childcare Worker; Clergy; EMT/Paramedic; Massage Therapist; Park Naturalist; Physical Therapist/Assistant; Probation Officer and Correctional Treatment Specialist; Recreation Worker; Social Worker; Registered Nurse; Speech-Language Pathologist; Teacher; Tour Guide.</td>
</tr>
<tr>
<td><strong>Enterprising (E)</strong></td>
<td>Typically prefer work that involves persuading, influencing, and directing others and are often interested in economics and politics. They enjoy work activities such as sales, supervision, and project or business management. They like work that is fast-paced, requires a lot of responsibility and decision-making, and requires taking risks for profit. Enterprising types prefer to work with people and ideas rather than things. Enterprising occupations generally require workers to have leadership, sales, and speaking abilities.</td>
<td>Advertising Sales Agent; Air Traffic Controller; Chef; Chief Executive; Coach; Construction Manager; Judge; Lawyer; Marketing Manager; Meeting and Convention Planner; Detective/Criminal Investigator; Public Relations Specialist; Real Estate Agent; Securities and Commodities Trader; Telemarketer; Travel Guide.</td>
</tr>
<tr>
<td><strong>Conventional (C)</strong></td>
<td>Typically prefer work activities that involve establishing or maintaining orderly and accurate records, procedures, and routines. They like working with data, or machines and applying precise standards in a setting where there is a clear line of authority. Conventional types prefer working with data and details more than with ideas. Conventional occupations generally require workers to have clerical, organizational, and arithmetic abilities.</td>
<td>Accountant and Auditor; Budget Analyst; Construction and Building Inspector; Court Reporter; Fire Inspector; Immigration and Customs Inspector; Information Security Analyst; Librarian; Loan Officer; Medical Transcriptionist; Paralegal; Pharmacy Technician; Legal/Secretary; Statistician; Tax Preparer.</td>
</tr>
</tbody>
</table>
FYI Description and Scoring

The FYI contains 90 items and provides students with reliable and valid results. Students can take the FYI electronically at the CEP website (see Figure 1) — www.asvabprogram.com — or by using a paper-and-pencil version.

Because of its relative brevity, most students will find they can complete and self-score the paper-and-pencil version of the FYI in about 15 minutes. The electronic version is scored automatically and students are able to see their results immediately. To help ensure that the FYI assesses interest rather than competence or aptitude, students are told: “Don’t be concerned with how well you would do any activity or whether you have the experience or training to do it. Just think about how much you would like or dislike doing the activity.”

The FYI employs a three-point scale of Like (“I would like to do this activity.”), Indifferent (“I don’t care one way or the other.”), and Dislike (“I would not like to do this activity.”). In scoring the FYI, a Like receives a score of 2, an Indifferent is scored as 1, and a Dislike is scored as 0. Raw scores can range from 0 to 30, with higher scores reflecting higher degrees of interest in that domain.

Development of the FYI

A three-phase development process was employed in the creation and initial validation of the FYI as a measure of the RIASEC domains associated with Holland’s theory of vocational choice. Phase I focused on foundational issues such as articulating and specifying the constructs to be assessed, identifying the kinds of items necessary to do so, deciding on the appropriate format for those items, the item-writing process, and writing trial items. In Phase II, the trial items were administered to two large national samples of high school students as a pilot test. The psychometric and statistical characteristics and properties of the items were evaluated in order to decide on a smaller group of items for inclusion in a trial version of the FYI. In Phase III, the trial version was administered to another large and nationally representative sample of high school students. Based on both the empirical results and further conceptual analysis, the final set of items was identified, the FYI scales and form was finalized, and a set of appropriate national norms was created.

For the FYI to produce an accurate profile of activity-based RIASEC interests, these activities must be attractive to adolescents. Over 1,000 items were written based on the types of activities associated with the RIASEC domains. These initial items were written to: (a) be understandable to students, (b) be equally relevant for all students, and (c) provide content coverage of each RIASEC domain. An expert panel reviewed the items and selected the highest quality items and eliminated any that might lead to biased results. The resulting set of 515 tryout items were administered to over 5,000 high school students in 48 randomly selected schools. Based on psychometric and statistical analysis of students’ responses to these tryout items, the best performing 120 items were selected for further review and scrutiny in a second large national sample of high school students. This study was conducted to identify the best 90 items that would comprise the final form of the FYI. In both studies, students completed the 1994 version of the Strong Interest Inventory (SII; Harmon, Hansen, Borgen, & Hammer, 1994) and an experimental version of the Career Exploration Program Interest Inventory (CEPII). In the study, schools were randomly assigned to administer either the SII or the CEPII first. This counterbalanced design was used to ensure that the order of administration of the two instruments was not a factor in students’ responses. In the second study, the FYI was administered to a sample of 1,958 students in 19 randomly selected schools nationwide. The sample of schools included both public and private high schools; schools located in rural, urban, and suburban settings; and schools in every region of the country.
Both classical and IRT methods (Hambleton, Swaminathan, & Rogers, 1991) were employed to evaluate the performance of items and scales. IRT was used to evaluate the magnitude of information provided by the items and to make comparisons of the item and scale performances within the experimental inventory and the SII. Employing both classical and IRT methods to select the items resulted in a new interest inventory that provides students with a highly accurate RIASEC profile that they will find useful for career exploration purposes.

A detailed description of the use of IRT to develop interest inventories can be found here.

**FYI Reliability**

The internal consistency of the FYI scales, as assessed by coefficient alpha, ranged from .92 to .94. It appears that the FYI produces highly reliable scores for high school students. Additional evidence, shown in Table 4, for the stability of the scores was obtained from 259 students who completed the FYI on two occasions over a two to two-and-a-half week interval. For this subsample of students, the unweighted test-retest correlations were quite substantial, ranging from a low of .89 (Enterprising) to a high of .93 (Artistic). The test-retest correlations were .92, .92, .93, .91, .89, .90 for the Realistic, Investigative, Artistic, Social, Enterprising and Conventional scales, respectively. These test-retest correlations rival the coefficients alpha in magnitude. Additional evidence for the stability of scores was obtained by calculating the standard error of measurement (SEM), which assesses the amount of change one might expect over repeated applications of a measure. FYI SEMs ranged from a low of 1.94 (Conventional) to a high of 2.49 (Artistic). These standard errors indicate that if an individual were to take the FYI again, there is a 68% chance that the new score would be within about two points of the original score. This suggests that the FYI scores are stable over time.

**FYI Validity**

As noted before, validity refers to the accuracy of the inferences made from test results. Expert judgment and psychometric and statistical methods were employed to validate that the FYI items provided both balanced and comprehensive coverage of the RIASEC domains. Empirical analyses were performed to examine the (a) FYI item and scale internal relationships, and (b) relationships between FYI item/scales and the various scales in the 1994 version of the Strong Interest Inventory (SII; Harmon, Hansen, Borgen & Hammer, 1994). The Strong Interest Inventory has extensive research supporting it and can be effectively used to support the validity of the FYI or other inventories designed to assess Holland interest RIASEC types.

The analyses supported the use of the FYI as a valid indicator of RIASEC types. Results of a large national sample of high school students showed that the FYI (a) is composed of six factors with each factor representing one RIASEC domain, (b) has a hexagonal shape, and (c) has substantial relationships with the 1994 Strong Interest Inventory. Throughout the analyses, consistent content, criterion, and construct-related evidence for the validity of the FYI were provided.

More detailed information regarding the validity of the FYI can be found in FYI Technical Document (U.S. Department of Defense, in progress).

<table>
<thead>
<tr>
<th>FYI Scale</th>
<th>Mean</th>
<th>SD</th>
<th>SEM</th>
<th>α</th>
<th>R</th>
<th>I</th>
<th>A</th>
<th>S</th>
<th>E</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Realistic (R)</td>
<td>9.82</td>
<td>8.92</td>
<td>2.14</td>
<td>.94</td>
<td>.92</td>
<td>.31</td>
<td>.13</td>
<td>-.01</td>
<td>.09</td>
<td>.17</td>
</tr>
<tr>
<td>Investigative (I)</td>
<td>10.07</td>
<td>9.10</td>
<td>2.19</td>
<td>.94</td>
<td>.92</td>
<td>.40</td>
<td>.21</td>
<td>.26</td>
<td>.18</td>
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</tr>
<tr>
<td>Artistic (A)</td>
<td>11.73</td>
<td>8.76</td>
<td>2.49</td>
<td>.92</td>
<td>.93</td>
<td>.44</td>
<td>.38</td>
<td>.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Social (S)</td>
<td>12.11</td>
<td>9.20</td>
<td>2.30</td>
<td>.94</td>
<td>.91</td>
<td>.43</td>
<td>.32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enterprising (E)</td>
<td>9.55</td>
<td>8.06</td>
<td>2.26</td>
<td>.92</td>
<td>.89</td>
<td>.57</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conventional (C)</td>
<td>7.33</td>
<td>7.72</td>
<td>1.94</td>
<td>.94</td>
<td>.90</td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

Note. N = 1,958 weighted analysis. aTwo-week test-retest correlations based on subsample of N=259. bSD = standard deviation. cSEM = standard error of measure. dCoefficient alpha. Corresponding RIASEC scales underlined for ease of interpretation.
FYI Gender and Diversity Concerns
During the development of the FYI, great care was taken to help ensure that the final instrument was useful for all students, regardless of their gender or racial/ethnic heritage. In the item selection process, a number of statistical decision rules were employed to eliminate poor-performing items and select items that would tend to produce scales that minimized racial/ethnic and gender differences. Specifically, item-level means, item-to-scale correlations, hexagonal pattern correlations, and reliability indices were calculated and used to eliminate items that would tend to favor one group of students over another group of students. For example, items with a very low item-to-scale correlation (i.e., .40 and below) were eliminated. This rule was applied to the combined group data and to the data for each gender, racial, and ethnic group. These statistical procedures, used in concert with expert judgment, created an item selection process that gave preference to items that minimized differences in the RIASEC constructs across the gender/racial/ethnic groups represented in the sample. Analyses were also conducted to ensure there were no important group differences for age, grade level, urbanicity, school type, or region.

Although an effort was made to create scales that were more sensitive to respondents' interest patterns than to respondents' gender, the world of work has consistent gender differences. As a result, a gender-based scoring method was developed to provide students with results based upon combined group norms and gender-specific norms.

FYI Norms
The FYI provides both gender-based and gender-combined percentile scores for interpretation.

The norms for the FYI are based on the results of the large national sample of students from schools that were randomly selected and the resulting sample was weighted to be nationally representative. Because the paper-and-pencil version of the FYI is self-administered and self-scored, students determine their raw scores that they then convert to combined group percentile equivalent scores. Next, they plot their raw scores on gender-sensitive graphs. When students take the FYI online, they are provided with both their combined group and gender-based percentile equivalent scores as shown in the Figure 2.

While an effort was made to create FYI items that are similarly relevant for males and females alike, gender differences do exist at the scale level (e.g., females generally have higher scores on the Social scale). The inclusion of gender-based results (a) acknowledges the gender differences on the FYI scales and (b) facilitates a greater opportunity for occupational and career exploration by providing students with scores that allow comparisons with their same sex peers. In Figure 2 above, a male student received a combined percentile score of 82 on the Social Interest Code. This score would indicate that his preference for Social activities is the same or stronger than 82% of students taking the FYI. Compared to other males, however, his score is 96%. The gender-specific results would indicate that he should consider Social occupations, as this is now his second highest interest code. As can be seen, the use of gender-based percentile scores provides a normative interpretation designed to help students consider a wider range of occupations than they may consider based on gender-combined norms. Both the gender-specific and gender-combined norms can be found FYI Technical Document (U.S. Department of Defense, in progress).
The OCCU-Find: Technical Information at a Glance

The OCCU-Find provides the vehicle by which students explore occupations through the ASVAB Career Exploration Program (CEP). Students can explore occupations corresponding to their top Interest Codes from the FYI, and learn about the skill requirements (Skill Importance Ratings) of occupations of interest. Students can then compare their own skills, at a given point in time as measured by ASVAB Career Exploration Scores, to the Skill Importance Ratings of occupations. When using the OCCU-Find through the ASVAB Career Exploration Program website (see Figure 3), students can also view occupational videos and enjoy a more interactive exploration experience.

The OCCU-Find presents students with close to 500 occupational titles from the O*NET taxonomy. O*NET is a comprehensive database of worker attributes and job characteristics for over 1,000 U.S. occupations (www.onetcenter.org/research.html/O*NET). These titles, characterised by primary RIASEC code, were selected to represent both the current and emerging worlds of work. The number of OCCU-Find occupations within each RIASEC code represents the composition of the world of work in terms of distribution of occupations across the six interest types. For instance, the list of Realistic occupations is longer than the list of Artistic occupations because there are more Realistic occupations in our society than Artistic occupations.

Students with few potentially satisfying and desirable career choices are often those most at risk in their transition from high school to the world of work. Because of this, one of the primary objectives of the ASVAB CEP is to provide a sufficient number of occupations for students with differing abilities and interests to explore. Having a broad range of occupations can help ensure that every student who participates in the ASVAB CEP can identify and investigate potentially satisfying and rewarding occupations.

This section will highlight the development of the OCCU-Find taxonomy, including the Skill Importance Ratings of occupations, and the ongoing updates made to the OCCU-Find. Additional detail on the technical underpinnings of the OCCU-Find can be found in the ASVAB Career Exploration Program: Theoretical and Technical Underpinnings of the Revised Skill Composites and OCCU-Find.

Taxonomy Development

The OCCU-Find was developed in two stages. The first step was to identify a sound linkage between the Verbal Skills, Math Skills, and Science and Technical Skills composites from the ASVAB test...
and the importance of these skills for job success. The second critical step was to select the specific occupations that would be included in the OCCU-Find.

**Development of Skill Importance Ratings Linked to Career Exploration Scores**

The OCCU-Find provides Skill Importance Ratings that correspond with the three Career Exploration Scores students receive on the ASVAB. For each OCCU-Find occupation, ratings are shown for Verbal Skills, Math Skills, and Science and Technical Skills. The Skill Importance Ratings show if the skill set is less important, moderately important, or very important to the job in question. It is important to note that the ratings refer to the importance of the skill set, not the level of a given skill that is required. For example, Math Skills are rated very important for the occupation Market Research Analysts; however, this does not mean that an individual must have an advanced degree in mathematics to qualify for the occupation.

The OCCU-Find Skill Importance Ratings were first developed in 2002 using a composite of Knowledge, Skills, and Abilities (KSA) ratings from the O*NET database. Of particular importance to the OCCU-Find are the worker requirements, a category of descriptors that refer to work-related characteristics acquired through experience or education. Chief among these are the approximately 110 KSAs needed to perform successfully in an occupation (O*NET, 2010). Expert analysts reviewed the O*NET database and identified 26 KSAs that related to the three ASVAB Career Exploration Scores. Composite scales for Verbal, Math, and Science/Technical Skills were constructed by combining together the importance scores of the 26 KSAs from the O*NET database. Adequate scale reliabilities were found for the three scales (.91, .90, and .82 for the Verbal, Math, and Science and Technical Scales, respectively). A score on each of these scales was calculated for each occupation in the O*NET database.

Next, a cluster analysis was performed that placed each O*NET occupation into one of three groups (high, moderate, low) on each of the three scales; this was done to ensure a sufficient number of occupations existed within each level of skill importance. The results of this and other analyses supported the use of these composites. A detailed description of these analyses can be found in the ASVAB Career Exploration Program: Theoretical and Technical Underpinnings of the Revised Skill Composites and OCCU-Find.

**Selection of Occupations for the OCCU-Find**

Specific occupations were selected for inclusion in the OCCU-Find with the goal of providing the most current set of occupations (both civilian and military) for career exploration purposes. In selecting occupations, a representative sampling approach was utilized to select occupations that would be similar in nature and content to the entire list of occupations in the O*NET database. In doing so, occupations were selected to include both civilian and military occupations, occupations with large numbers of employees, occupations with a high expected growth rate over the next ten years, and occupations with relatively good status. Of paramount importance was selecting a mix of occupations within each RIASEC domain and occupations that represented various levels of skill importance.

**Updates to the OCCU-Find**

**Updated Skill Importance Ratings**

In 2008, a new methodology for updating the Skill Importance Ratings was developed, tested, and validated. The new methodology entailed independent analysis of occupational requirements.

The resulting Skill Importance Ratings were analyzed to ensure they were reliable and still provided students with sufficient careers to explore. The updated Skill Importance Ratings demonstrated satisfactory psychometric and distributional properties. Interrater reliability coefficients were significant, with the average being .93, .91, and .96 respectively for the Verbal, Math and Science and Technical Skill Composites. In addition, the distribution of OCCU-Find careers across the various Skill Importance Ratings was found to be sufficient for career exploration purposes. For a complete description of these and other analysis results, see the ASVAB Career Exploration Program: Theoretical and Technical Underpinnings of the Revised Skill Composites and OCCU-Find.

**Updates to Occupational Taxonomy**

In order to provide the most current career information for students, DoD is continually striving to update the information in the OCCU-Find. Since the O*NET database provides the basis for the occupational information in the OCCU-Find, changes to O*NET are analyzed on an ongoing basis to determine potential impacts on revisions to the OCCU-Find. The types of changes that have been made to the OCCU-Find as a result of changes in O*NET include the addition of new and emerging occupations, changes in the structure of the taxonomy, and changes in detailed occupational information (e.g., task descriptions, interest codes).

**New and Emerging Occupations**

The O*NET database is updated regularly to reflect the ever changing world of work. As of the 2011 O*NET, these updates included the addition of 156 New and Emerging occupations. From these, 16 occupations were selected to be added to the OCCU-Find, using the following steps.
1) Identify occupations that O*NET identifies as having Numerous Job Openings and Rapid Growth.
First, occupations were selected that O*NET categorized as having Numerous Job Openings and Rapid Growth. In addition to being classified as New and Emerging (N & E), certain O*NET occupations were identified as having Numerous Job Openings and/or experiencing Rapid Growth. As a first step in narrowing down the list of N & E occupations for the purposes of OCCU-Find, analysts identified the O*NET occupations that were also categorized as having Numerous Job Openings and Rapid Growth. Eight occupations met these criteria. Of those, the following six had job data collected on them:

- Regulatory Affairs Specialists
- Informatics Nurse Specialists
- Acute Care Nurses
- Advanced Practice Psychiatric Nurses
- Critical Care Nurses
- Transportation Engineers

Next, occupations that had either Rapid Growth or Numerous Job Openings were identified. In this step, 28 occupations met these criteria and also had available job data. These two steps resulted in the identification of 34 jobs to consider for addition to the OCCU-Find.

2) Select occupations to cover a range of job families and skill levels.
In order to pare down this list further, the 34 occupations identified were grouped into similar job families. Similar jobs were compared and a decision was made as to which of those occupations to include. For example, Critical Care Nurses were selected from the list above rather than Acute Care Nurses and Advanced Practice Psychiatric Nurses.

In addition to selecting occupations to best represent a variety of industries, occupations that require less education were selected to provide expanded career development options for students with varying educational plans. The resulting New and Emerging occupations that were added into the OCCU-Find are presented in Table 5. Skill Importance Ratings were generated for each of these occupations and were added to the OCCU-Find.

Updates to O*NET Job Data
O*NET is updated on a cyclical basis. Each update is typically focused on specific components of the O*NET Taxonomy. These updates are continually analyzed for potential impacts on the OCCU-Find. O*NET updates that have impacted the OCCU-Find include updated interest codes (2009) and taxonomy changes (2010).

The 2009 O*NET contained significant changes in Interest Codes. These changes were analyzed in depth. In the majority of cases, the OCCU-Find Interest Codes were changed to be consistent with the updated O*NET codes. There were some exceptions, however.

First, the OCCU-Find has a smaller number of Artistic occupations than those within other Interest Codes. To preserve the availability of options for students with Artistic interests, the proposed changes to Artistic occupations were reviewed for face validity. Those occupations that appeared to be more strongly related to Artistic interests than the proposed revised Interest Code were highlighted. Analysts examined the detailed O*NET ratings given for these occupations to ensure that large discrepancies were not ignored.

Another set of O*NET interest code changes which were not made to the OCCU-Find were the large number of occupations that moved from the Realistic to the Investigative interest area. Many of the proposed occupations to move had high Skill Importance Ratings. Since the Investigative jobs already have mostly high Skill Importance Ratings, it was felt that leaving the occupations in the Realistic grouping would better serve the ASVAB purpose of providing a wide range of occupations for individuals at all interest and skill levels.

Table 5. New and Emerging Occupations Added to OCCU-Find

<table>
<thead>
<tr>
<th>Occupations Added to 2012 OCCU-Find</th>
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<tbody>
<tr>
<td>Regulatory Affairs Specialists</td>
</tr>
<tr>
<td>Logistics Analysts</td>
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<tr>
<td>Energy Auditors</td>
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<tr>
<td>Baristas</td>
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<tr>
<td>Loss Prevention Managers</td>
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<tr>
<td>Online Merchants</td>
</tr>
<tr>
<td>Securities and Commodities Traders</td>
</tr>
<tr>
<td>Pathologists</td>
</tr>
<tr>
<td>Radiologists</td>
</tr>
<tr>
<td>Neurologists</td>
</tr>
<tr>
<td>Sports Medicine Physicians</td>
</tr>
<tr>
<td>Transportation Engineers</td>
</tr>
<tr>
<td>Security Management Specialists</td>
</tr>
<tr>
<td>Anesthesiologist Assistants</td>
</tr>
<tr>
<td>Informatics Nurse Specialists</td>
</tr>
<tr>
<td>Critical Care Nurses</td>
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The ASVAB Career Exploration Program: Technical Summary

Links:

Item Response Theory (IRT) model:  
http://official-asvab.com/understand_res.htm

Portrait of American Youth 1997 PAY 97:  
http://official-asvab.com/PAY97_res.htm

Validity of the ASVAB:  
http://official-asvab.com/validity_res.htm

ASVAB Test Fairness:  
http://official-asvab.com/fairness_res.htm

Test Bias and Differential Prediction:  

Theoretical and Technical Underpinnings of the Revised Skill Composites and OCCU-Find:  

ASVAB Norms for the Career Exploration Program:  

ASVAB Technical Bulletin No.4:  

Using Item Response Theory to Develop an Interest Inventory:  

References:


