Spatial Ability

Spatial ability has been long recognized as an important factor and/or correlate of long term success in the Science, Technology, Engineering, and Math domains (Wai, et al., 2009; Webb et al., 2007; Casey et al., 1995). The spatial ability portion of the web-based STEM-Score™ Assessment (developed by Paul de Gennaro, PhD) consists of a multiple choice, speed-test format that students can complete at any school site with internet access. Figure 1 provides an example of one of the type of stimuli provided in this particular subtest.

Proportional Reasoning

Proportional reasoning has long been recognized in the developmental and educational literature as a core cognitive form of constructing relations from the qualitative (e.g., a thinner/longer equals a fatter/shorter rectangle) to the quantitative (e.g., a 5oz weight 4in from the fulcrum of a beam balance a 10oz weight 2 in from the fulcrum). Such proportional reasoning is often central to the understanding of, and calculating in, domains of knowledge ranging from arithmetic (e.g., fractional ratios) to
physical (e.g., spatial area relations between rectangles and causal balancing relations between weight and distance) (Fuson & Abrahamson, 2005; Lesh, Post, and Behr, 1988).

Proportional reasoning abilities are also measured as part of the web-based STEM-Score™ Assessment, and it contains nonverbal questions reflecting traditional task stimuli relating to both direct and indirect proportions. This subtest was again designed employing a multiple-choice format, and limited to verbal instructions at the introduction and not with any of the question stimuli specifically (see Figure 2, for an example of test stimuli).

Figure 2
Sample Stimulus for Proportional Reasoning Subtest

Pitch Pattern Perception

Success in Science and Allied Health courses are largely dependent upon a command of scientific language, which is of course Latin based, by virtue of it’s beginnings. Posedel, et al., (2011) found pitch perception to be a significant predictor of word pronunciation performance in learning a second language, and Comeau et al., (1999) found that phonological awareness skills actually transfer across alphabetic languages. Therefore, regardless of English placement scores, students with significant phonemic or phonological difficulties may have to make much greater efforts (than their more skilled counterparts) to learn correct pronunciation and spelling of newly introduced science course content.

This skill is also measured by the web-based STEM-Score™ Assessment, based on a growing body of research supporting a correlation between pitch test performance
and phonological and/or phonemic awareness assessment performance (Jones, et al., 2010). The stimuli are sample melodies of very short duration (2-3 seconds), played in pairs. The students/participants are to determine whether the paired melodies are exactly the same, or differ in their tonal pattern. Ability to distinguish these patterns has been implicated as a correlate to language processing (Jones et al., 2009; Skipper, et al., 2007), from both a developmental perspective and in the acquisition of a new language (scientific terminology, in this instance).

For more information visit stem-score.com