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Employability in the 21st Century: Complex (Interactive) Problem Solving and Other Essential Skills

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Neubert, Mainert, Kretzschmar, and Greiff (2015) plea to integrate the 21st century skills of complex problem solving (CPS) and collaborative problem solving (ColPS) in the assessment and development suite of industrial and organizational (I-O) psychologists, given the expected increase in nonroutine and interactive tasks in the new workplace. At the same time, they promote new ways of assessing these skills using computer-based microworlds, enabling the systematic variation of problem features in assessment. Neubert and colleagues' (2015) suggestions are a valuable step in connecting differen-

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tial psychologists' models of human differences and functioning with human resources professionals' interest in understanding and predicting behavior at work. We concur that CPS and ColPS are important transversal skills, useful for I-O psychologists, but these are only two babies of a single family, and the domain of 21st century skills includes other families of a different kind that are also with utility for I-O psychologists. The current contribution is meant to broaden this interesting discussion in two important ways. We clarify that CPS and ColPS need to be considered in the context of a wider set of 21st century skills with an origin in the education domain, and we highlight a number of crucial steps that still need to be taken before "getting started" (Neubert et al., 2015, p. last page of the discussion) with this taxonomic framework. But first, we feel the need to slightly reframe the relevance of considering 21st century skills in I-O psychology by shifting the attention from narrow task-related skills to the broader domain of career management competencies.

Nonroutine and Interactive Tasks Versus Employability

Neubert et al. (2015) started from the assumption that future jobs will increasingly involve interactive and nonroutine tasks. Although educational frameworks of 21st century skills usually claim to affect a broad range of criteria, including quality of life, healthy behavior, civic engagement, and environmental sustainability, demonstrating labor market fitness and employability are among the key anticipated outcomes. The movement of 21st century skills is further particularly concerned about the skills of those growing up in difficult circumstances, who have lower education levels or disabilities or who are at risk of structural unemployment. In addition to advocating two skills related to task characteristics of more complex jobs, an alternative could be to introduce 21st century skills into I-O psychology, starting from an analysis of what employability means *anno* 2015, and to identify those skills that people will need to access and navigate flexibly on the labor market.

Broadly speaking, employability can be defined as an individual's labor market fitness and ability to be in charge of his/her own career. Considered at an operational level, employability can be minimally understood in terms of five characteristics. Hogan, Chamorro-Premuzic, and Kaiser (2013) define employability as a person's propensity to (a) show task engagement and goal setting, (b) interact with other people ("getting along" or "being rewarding to deal with"), and (c) adapt to/fit in an organizational structure or have the capacity to deploy such structure (for those pursuing self-employment). We propose two additional criteria—that is, (d) demonstrating the ability and flexibility to learn on the job and prepare for future challenges and (e) being able to manage and switch between short- and long-term perspectives. These two extensions of Hogan et al.'s (2013) framework are important,

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given the expectation that people will have to work longer in a more volatile and quickly changing labor market. Moreover, employees will be required to focus on their current job but, at the same time, will also have to reflect on and invest in future employability. Put differently, employees minimally need to (a) be willing to work and do the job (task engagement and goal setting), (b) be able to work with/among others, (c) fit in and endorse the values of an organization, (d) show an eagerness to learn and demonstrate flexibility and adaptability, and (e) be able to envisage and invest in current and future career paths (within or outside the organization).

These five characteristics define minimal requirements set by the current 21st century labor market across jobs varying in social prestige and job complexity. These employability indices tap into all basic personality dimensions defined by the five-factor model of personality (John & Srivastava, 1999), with task engagement and goal setting related to Conscientiousness, interpersonal skills related to emotion regulation (Emotional Stability) and the core dimensions of the interpersonal circumplex (Extraversion and Agreeableness), and "fitting in," "learning and adapting," and "time perspective" related to Openness to Experience and Conscientiousness. For jobs with higher complexity on the labor market, CPS and ColPS are definitely useful extensions, because they tap into more hybrid constructs at the intersection of social-emotional and cognitive skills.

Models in the Real World Versus Models From Academic Psychology

Although less elaborately discussed by Neubert et al. (2015), it is important to clarify that the concept of 21st century skills actually refers to a broader set of characteristics, of which CPS and ColPS are only two—be they important—examples. For example, *Assessment and Teaching of 21st Century Skills* (Griffin, Care, & McGaw, 2012) summarized 21st century skills under the acronym KSAVE (knowledge, skills, attitudes, values, and ethics) and grouped them into four broad categories: "ways of thinking," "tools of working," "ways of working," and "ways of living" in the world (Griffin et al., 2012). Trilling and Fadel (2009) listed over one hundred 21st century skills, grouped into the categories "learning and innovation skills," "digital literacy," and "life and career skills." Reviewing the content of these categories and lists shows an amalgam of constructs, with a first group referring to cognitive skills, a second cluster that is best described as social-emotional skills, and finally, a group of more hybrid constructs building on cognitive resources but also tapping into social-emotional skill content. CPS is a skill that is conceptually chiefly situated in the cognitive domain, whereas ColPS is probably best conceived as a hybrid construct related to, though distinct from, cognitive and social-emotional skills.

In line with Neubert and colleagues (2015), we agree that both skills have key importance for I-O psychologists but advocate at the same time

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that the cluster of social-emotional skills should also be brought to the attention of I-O psychologists. Social-emotional skills represent a large cluster in the 21st century skill domain, and they are crucial in evaluating individuals' suitability to work in a range of jobs with varying degrees of complexity. Social-emotional skills can be best defined as individual characteristics that (a) originate in the reciprocal interaction between biological predispositions and environmental factors; (b) are manifested in consistent patterns of thoughts, feelings, and behaviors; (c) continue to develop through formal and informal learning experiences; and (d) influence important socioeconomic outcomes throughout the individual's life.

Although each of the specific constructs in the above mentioned clusters (Griffin et al., 2012; Trilling & Fadel, 2009) has its own merits and importance, to move this field further, it is necessary to empirically structure this variability to better deal with overlap and represent the observed commonality into a taxonomy. Such taxonomy should then form the starting point to construct a comprehensive though manageable assessment tool that can be used in 21st century skill research, monitoring, and follow up.

Recently, Primi, Santos, John, and De Fruyt (2015) examined the underlying structure of eight instruments that are frequently used to assess social-emotional skills in childhood and adolescence in Brazil. They found a structure that showed strong parallels, but was not isomorphic, with the dimensions of the five-factor model of personality—that is, Extraversion, Agreeableness, Emotional Stability (Neuroticism), Openness to Experience, and Conscientiousness, supplemented with a sixth dimension referring to Negative Valence. These dimensions are well familiar to both cross-cultural and I-O psychologists (De Fruyt & Wille, 2013; Schmitt, 2014). Although Neubert and colleagues (2015) argued that constructs representing overarching transversal characteristics, such as intelligence and personality, would be of little value in concrete situations, the findings by Primi et al. (2015) showed the opposite for social-emotional skills, although these are different constructs than CPS and ColPS. Moreover, this empirical study showed that the five-factor model taxonomy was the most comprehensive of the eight measures that were examined, suggesting that this framework provided a good starting point to develop a new assessment tool for a large group of 21st century skills.

Developmental Paths, Malleability, and Predictive Validity

The field of 21st century skills is relatively young, and so far, efforts mainly concentrated on listing and conceptually grouping skills and especially creating awareness for their importance. Groups taking the lead in this policy and research endeavor also started working on developing new methodologies to assess these skills (e.g., CPS and ColPS). Whether this broad range

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of skills can be reliably and validly assessed will be a key factor for their implementation and integration success into I-O psychology. In an attempt to work with more application-oriented constructs, human resources and I-O psychology professionals are already working with the concept of competencies (Hoekstra & Van Sluijs, 2003), considered more helpful in concrete situations or to understand behavior at work. The assessment of these competencies in professional practice, however, turned out to be often difficult and sometimes even problematic. Pervasive problems associated with competency measurement include, among others, lack of evidence for construct and divergent validity. Moreover, competencies are often assessed in professional practice using assessment exercises with only one or two raters, with insufficient information on the reliability of the ratings. In order not to oversell, we strongly recommend that considerable attention be given to the assessment of the proposed 21st century skill constructs; otherwise, there is no argument to replace competency constructs with 21st century skills. Given time constraints to assess qualities in job applicants, I-O psychologists will not embrace over 100 different constructs, so taxonomic work will have to guide the assessment development program. To achieve this goal, models from differential psychology will be certainly helpful to structure and assess the cognitive and the social-emotional skill areas, but we agree that designing assessment tools for skills from the hybrid cluster will be most challenging.

I-O researchers and practitioners will be also curious about the developmental paths of 21st century skills and the factors that influence their track. At present, not that much is known on how 21st century skills develop and how malleable and coachable these are, in light of developmental constraints, environmental contingencies, and individuals' genetic makeup. With respect to Neubert et al.'s (2015) plea for integrating CPS and ColPS in I-O psychology, key questions are, for example, how do CPS and ColPS skills develop, in what contexts are these skills effective, and to what extent are they malleable and coachable?

The ultimate criterion to judge on the importance of a construct is whether it predicts something meaningful. Researchers and practitioners in the fields of 21st century skills and human resources share an interest in prediction. Educationalists want to monitor learning achievements and predict development of social-emotional skills at school and academic performance, culminating into students' employability when they enter the employment market. From that stage onward, I-O psychologists assess their potential and fit for filling up job vacancies and predicting future work performance. Whether I-O psychologists will embrace these 21st century assessment concepts and assessment tools will thus be highly dependent on these skills' validity to predict I-O outcomes and to do this better and more incrementally than currently existing selection assessment methodology.

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Incorporating "Soft Skills" Into the Collaborative Problem-Solving Equation

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In only a very few places, Neubert, Mainert, Kretzschmar, & Greiff (2015) mention the role of communication and coordination among team members in collaborative problem solving. Although complex and collaborative problem solving is indeed an imperative for team and organizational success in the 21st century, it is easier said than done. Collaborative problem solving is critically dependent on the communication and interaction skills of the

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