

## White Paper

# SkillsDX Diagnostic Assessment Framework

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### SkillsDX DIAGNOSTIC ASSESSMENT

The SkillsDX diagnostic assessment framework is designed to address the challenges of accurate skill assessment in a variety of individual and team tasks. SkillsDX is a web-based mobile app that uses Artificial Intelligence (AI) to perform two important functions: (1) Improve skill assessment methodology itself; and (2) help the human evaluator determine the most critical information to gather when assessing the skills of a trainee or of a team of trainees performing a task. Figure 1 illustrates the SkillsDX system organization, showing the interaction of the Observer Tool with the AI Analysis Engine.

### SKILLS ASSESSMENT CHALLENGES

Accurate assessment of technical skills has long been a challenge over a broad spectrum of domains that require efficient application of knowledge or use of complex systems to solve real-world problems — from clinical skills in healthcare to situation awareness in military operations. Depth and breadth of knowledge can be assessed using written and oral exams, but assessment of these

skills is problematic because it requires evaluation of performance on a real task and often relies on the judgment of an expert who directly observes a trainee during a training exercise or over the course of a practicum or apprenticeship.

Expert-based skill assessment sometimes requires longitudinal evaluation by a single evaluator to form an accurate picture of trainees’ skills, and it is naturally subjective —with typically wide variance across different observers. Expert evaluators often need to complete time-consuming written evaluations, which are difficult to use in providing specific feedback on where improvement is needed. And the challenge is compounded when assessing not just an individual, but a team of individuals who must perform complex tasks together.

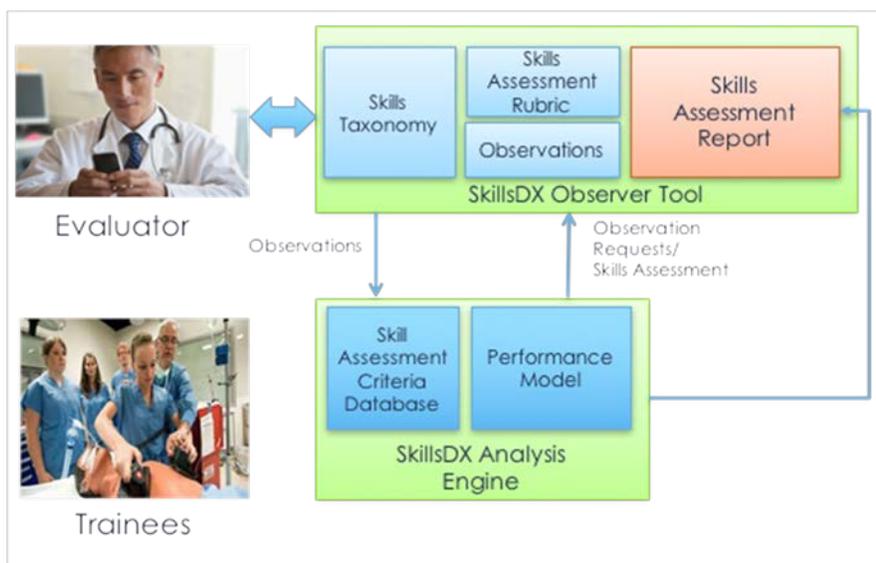


Figure 1 SkillsDX System Organization

Most attempts to provide a workable yet objective basis for skill assessment have relied on checklists. Checklists provide a means of normalizing the observation criteria but they are suboptimal because they require a tradeoff between efficiency and completeness. In order for the evaluator to work quickly and keep up with task performance, skill assessment checklists generally focus on broad skill categories and often overlook important details. The SkillsDX approach, as described below, meets the challenge of providing a tool that combines objective and effective assessment.

**RUBRIC- BASED OBJECTIVE ASSESSMENT CRITERIA**

At the core of SkillsDX is the use of an assessment rubric which maps observable skill criteria to levels of proficiency. An exemplar rubric which is provided by default is the Dreyfus Skill Acquisition Model, shown below in Figure 2, which combines proficiency dimensions (decision making, situational awareness ...) with performance criteria and maps them to levels of proficiency. Assessment rubrics can be set up as required for relevance to the task domain where SkillsDX is being applied.

		Skill Level				
		Novice	Adv Beginner	Competent	Proficient	Expert
Dimension	Knowledge					
	Standard of Work					
	Autonomy					
	Decision Making					
	Situational Awareness					

Figure 2 Dreyfus Skill Acquisition Model (Honken 2013)

**AI-BASED ADAPTIVE ASSESSMENT**

SkillsDX uses a Bayesian network to model task performance. When specific assessment criteria are mapped to dimensions of the rubric, as shown in Figure 3, the SkillsDX system generates an assessment based on the underlying performance model. This allows the AI component to

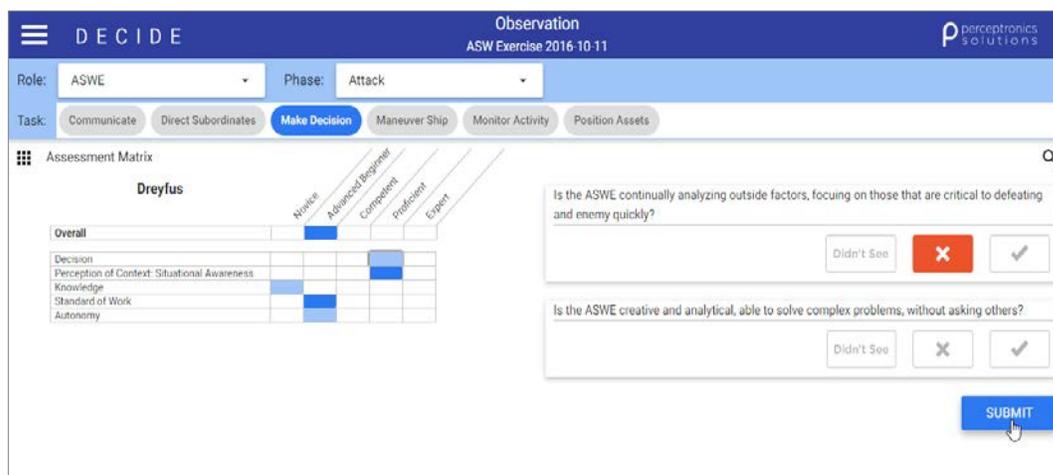


Figure 3 Mapping Assessment Criteria to Rubric Dimensions

reason about the data collected and form an accurate picture of a trainee's or team's skills as well as determine the most critical information gaps. The system requests information from the observer through the web or mobile interface, specifically guiding him or her towards observations of highest utility. As more information is obtained, the assessment adapts to illustrate the current status of the trainee or trainees.

### PERFORMANCE SCORE AND FEEDBACK

At conclusion of the assessment, SkillsDX provides a detailed view of the trainee's performance across the assessed tasks, as shown in Figure 4. Interrogating a specific subtask gives direct insight into the deficiencies observed, and can lead to precisely targeted directions for remediation. This provides a valuable capability to direct subsequent training beyond the basic creation of objective assessments.

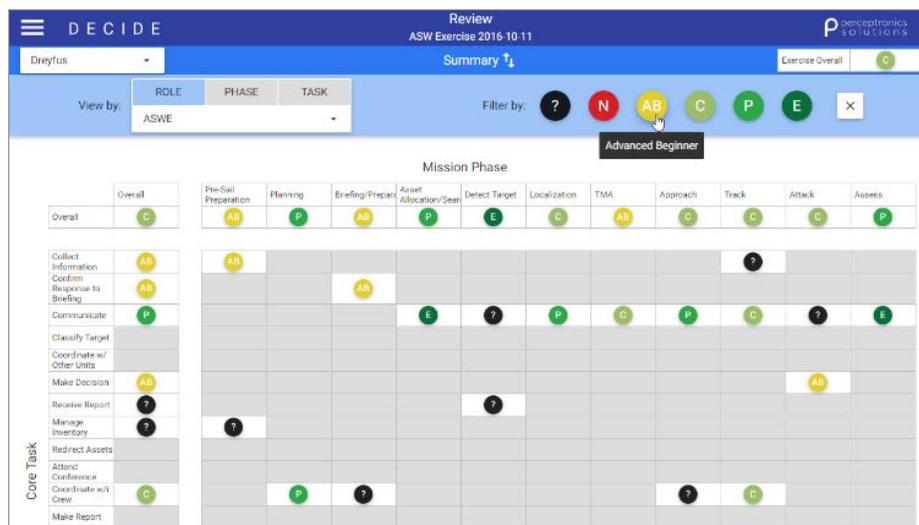


Figure 4 Trainee Performance Assessment Dashboard

### CONCLUSION

SkillsDX offers a new paradigm of AI-assisted assessment that solves many of the serious problems with conventional approaches. It provides the following benefits:

- Objective skill assessments across evaluators
- Assessment of both individuals and teams
- Short-term and longitudinal assessment across multiple evaluators
- Can be used to assess team resilience (as opposed to only task performance)
- Richer and more nuanced criteria than checklists in performing evaluations
- Feedback on trainee deficiencies and suggestions for remediation
- Eliminates the need for evaluators to write assessments which are often incomplete and done hastily.

Contact us at [skillsdx@percxsolutions.com](mailto:skillsdx@percxsolutions.com) to see how we can help address your challenges with accurate skill assessment.