Multi-Source Formative Assessment System for Competencies

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&

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Presented by Paul Thomas, CCR
Learner “Jagged” Profile as a Goal
SKILLS, CHARACTER, META-LEARNING

- Growth Mindset
- Metacognition
- Creativity
- Critical Thinking
- Communication
- Collaboration
- Leadership
- Ethics
- Mindfulness
- Curiosity
- Resilience
- Courage

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Data Structure

Substrands:
- Taking responsibility
- Sharing responsibility
- Leveraging strengths
- Transforming differences
- Finding solutions
- Respecting all perspectives
- Receiving feedback
- Giving constructive
- Empathizing with teammates
- Supporting teammates

Subcompetencies (60):
1. Taking and sharing responsibility
   - COL1
2. Utilizing each individual's unique skills and perspectives
   - COL2
3. Navigating and resolving interpersonal conflict
   - COL3
4. Giving and receiving constructive feedback
   - COL4
5. Empathizing with and actively supporting team members
   - COL5

Competencies (12):
- Critical Thinking
- Communication
- Collaboration
- Mindfulness
Proficiency over Time

RESILIENCE to single-point-of-failure:
- No pressure on psychometrics
- “can’t fool all the data points all the time”
FAIRNESS vs single measure
Polyhedral n-angulation

- Digital signals (objective)
- Situational Judgement Tasks (objective)
- Instructors’ evaluations of learners (team) (subjective & directional)
- Instructors’ evaluations of learners (Solo) (subjective & directional)
- Learners evaluations (self) (subjective)
- Learners evaluations (team) (subjective)
- Portfolio evaluations (objective & subjective)
- Physiological signals (interpretable)
- In-situ A/V observation (human, machine) (subjective)
- Etc
Completed Pilot on Collaboration

Internal mindsets
- Surveys and questionnaires
- Reflections

Blended
- Situational Judgement Tasks
- Self-report

External behaviors
- Performance tasks
- Digital signals
- Teacher evaluation
- Peer evaluation

“It Works”!
Assessment Management System

ADT (Design) (generates & banks assessments)

APT (Processing) (stores and processes data)

AUX (Display) Teachers, Students

AET (Analytics Engine Tool)
Learner-Level Information to Instructors, with Recommendations for Interventions

Assessment Summary
Alice’s self-assessment is lower than the composite assessment.

Recommendation
Encourage Alice to be confident about herself! It may be hard. But we expect Alice to express her thoughts and release energy.

Sub-Competency Summary
Alice did well at ‘Assessing validity and quality of information’ and ‘Applying sound reasoning to decision-making’ sub-competency. There is room for improvement in the ‘Consider other points of view’ sub-competency.

Growth Trend Summary
Alice showed a decreasing trend for ‘Critical Thinking’ in the past 3 months.

Recommendation
To increase the math critical thinking competency, Alice can try to solve more authentic problems using math. When facing a math question, Alice can also ask herself whether there is another way to look at this question.
Analytics - overall

Analytics will serve to:

• Offer guidance re Competencies:
  • Biases, causalities, predictions, etc.
  • Interventions
  • Model simplification
• Explore correlations between Knowledge and Competencies
  • Tie to pedagogical practices
  • Deepen cognitive domain capabilities
• Formulate theories of SEL progressions based on data gathered
“Synthroids”: 1 Million Synthetic Learners database

A First in Education
• Analog to Health Care: “synthetic patients” - from small sample, not involving thousands of patients.

Leading to Analytics:
• Personal improvement profiles, and “Digital Twin” simulation
• Theories of mind in social-emotional learning
## Example of Relevance to DoD
**ARI FSRU BAA W911NF-21-S-0007**

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<td>1. Develop psychometric approaches for deriving valid construct score estimates from highly granular streams of data.</td>
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<td>2. Develop novel psychometric quantities beyond those of classical (e.g., reliability, validity) and modern (e.g., item and test information) test theory</td>
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<td>4. Develop novel construct validation models and methods that explicitly incorporate time. Diverse conceptualizations of time (e.g., observed, latent, discrete, continuous) are highly encouraged.</td>
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<th>2. Learning in Formal and Informal Environments</th>
<th>I. Choice and the Individual Learner</th>
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<td>e. Further understand how the learner interacts with and uses different types of feedback (e.g., formative or summative, synchronous, or delayed, from subject master or peer).</td>
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<td>II. Learning and Socialization</td>
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<td>c. Develop learning theories revealing the underlying mechanisms that link emotions, emotion regulation, and emotion socialization and the retention of knowledge and skills.</td>
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<td>d. Develop pedagogical theories and frameworks evaluating approaches and practices that foster knowledge, comprehension, skills, far transfer, and continuous learning in formal and informal settings.</td>
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Thank You