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Multi-Session Demonstration of Competency-Based Experiential-Learning Model for the US Army Synthetic Training Environment (STE)

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Demonstration of a Competency-Based Experiential-Learning Concept for the US Army Synthetic Training Environment (STE) Narrative Brief

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Synthetic Training Environment (STE) Focus Areas



STE Experiential Learning - Readiness (STEEL-R) Core Components

Generalized Intelligent Framework for Tutoring (GIFT)

- Establishes real-time data capture w/ Training Environment and Peripheral Sensors / Devices
- Manages data- and observer-driven assessments through integrated task model
- Emits evidence-centered xAPI statements based on GIFT Task Model

Learner Record Stores (LRS)

- Noisy LRS captures all data (i.e., formative and summative assessments)
- Transactional LRS captures xAPI statements that conform to ADL's "Master Object Model" (MOM) profile

Competency and Skill System (CaSS)

- Maintains competency frameworks
- Translates xAPI statements into "Assertions"
- Computes learner and team profiles from Assertions
- Visualizes learner and team profiles in STEEL-R dashboard



STEEL-R Experiential Learning Process

- 1. <u>COMPETENCY STATE & RECOMMENDED TRAINING</u> <u>FROM LONGITUDINAL DATA-DRIVEN DASHBOARD</u>
- 2. SELECT & CREATE GOAL FOCUSED SYNTHETIC (SEMI-LIVE) EXPERIENCE EVENT-BASED ASSESSMENT METHODS
- 3. <u>AUTOMATE SETUP & PREPARATION OF</u> <u>TEAMS/SOLIDERS</u> FOR INDIVIDUAL/COLLECTIVE SYNTHETIC TRAINING EXPERIENCES
- 4. EXECUTE SCENARIOS WITH <u>REPETITIVE AUTOMATED</u> <u>ASSESSMENT & INTELLIGENT TUTORING SUPPORTS</u>
- 5. CONDUCT DATA INFORMED AFTER ACTION ANALYSIS, ASSESSMENT AND REVIEW (A4R)
- 6. <u>SAVE ALL PERFORMANCE DATA OVER TIME /</u> <u>CONTEXT & OBJECTIVELY UPDATE COMPETENCE</u> <u>CALCULATIONS</u>
- 7. <u>REVIEW DATA-DRIVEN DASHBOARD</u> & BEGIN AGAIN



GIFT: Generalized Intelligent Framework for Tutoring A4R: After-Action Analysis, Assessment, Review

LRS: Learning Record Store CaSS: Competency and Skill System

What is Competence?

- Competence is an individual or team's longitudinal state of (combat) performance readiness
 - Based on data from previous (longitudinal) experiences (classroom, synthetic, live) that provide higher validity.
- Based on an objective math-model that is working in a "WHO" framework (see handout):
 - <u>How Well</u> recent performance meets *current* combat expectations (based on data)
 - <u>How Hard</u> (difficulty-on average) was the conditions one performed in
 - <u>How Often</u> did one perform WELL in HARD conditions within recent window of time.
 - Competence decays over time.



What is Experiential Learning?

- Based on idea that Learning happens through *tension* and *conflict* built into the curriculum / experience (i.e., difficulty).
 - Challenging mental models creates tension and drives the learning process.
- Tensions are resolved through iterations of experience, reflections and applying new ideas, knowledge, attitudes or behaviors that result in change (in competence) as measured by data evidence.
- Key is to ensure the experience-difficulty and the traineecompetence are matched (Zone of Proximal Development)
- Key measures are individual's task performance (e.g., safety, accuracy and latency) and task effectiveness (results and outcomes).



Original Model (David Kolb and Roger Fry 1975)

PREPARE – SET UP STE SCENARIO



- Select Experience
- Start Host
- Review Trainee Profile
- Adjust Experience
- Assign Trainees to STE Devices
- Assign Trainees to Teams / Roles
- Start Experience



Experience Set-up Demo

EXECUTE – EXPERIENCE SITUATION, CONDITIONS WITH REAL-TIME ASSESSMENT AND INTERVENTION





Synthetic (or Live) Experience Execute and Real-time Assessment Demo

xTSP -> GIFT -> xAPI -> CaSS

xTSP xAPI Report Profile

"taskId": 1, "taskUuid": "ATP 3-21.8-C1-pp273", "compFramework": "http://competencyFramework/#", "competency": "http://competency/#", "taskTitle": "Direct Formation, Spacing and Sectors", "cue": "Intent to move", "safetyRisk": "low", "taskMeasures": ["msrId": 1, "msrTitle": "Order Formation", "msrTvpe": "behavior" "msrClass": "summative", "position": 1 "dataSources": ["Video" "Audio" "evaluation": { "uuid": "http://evaluations/forms/#", "evaluationMethod": "manual" "defaultMeasure": "below-expectation", "inputs": ["<div>HTML or javascript with form inputs for level sele "criteria": [....] msrReport": "id": "e1b248ba-1726-11ed-861d-0242ac120002", "actor": "sean.f.meers.mil@army.mil",

"d": "elo2480a-1726-11ed-851d-9242aC12002", "actor": "sean.f.meers.mi@army.mil", "verb": "Ordered", "boject": "Formation", "result": "At Expectation", "context": "Xevent ABCD", "timestamp": "2022-08-08T05",2134.804+00:00", "stored": "2022-08-08T05",2134.804+00:00", "stored": "2022-08-08T05",2134.804+00:00", "authority": "https://ste.army.mil/oauth_consumer_x75db",







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GIFT Log File -> xAPI



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http://virtualmeeting.example.com/345256" }, "objectType": "Activity" } }



LRS xAPI -> Competence

What does all this competency stuff enable? (with)



STEEL-R xAPI and ADL TLA



AFTER-ACTION ANALYSIS, ASSESSMENT & REVIEW (A4R)

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Individual-Role Analysis / Assessment / Review

- Immediately after the execution, SGT Meers places team on break and conducts an A4R using recorded teamlevel and individual-role data
- He can now assess more carefully and cite actual data (channel/time) when making electronic assessments (e.g., video) to support competence validity.
- Can use actual data to support feedback and discussion.
- Can use data to "baseline" expectations from previous units' performance.
- Also labels data for ML/AI



After-Action, Analysis, Assessment Review (A4R) in Game-Master application Demo



A4R in Battlespace Visualization and Interaction (BVI) Demo

Example GIFT task model and data-enabled condition classes



STEEL-R Performance Assessment and Competence Assertion Outputs



Task Competence Level

SIMPLIFIED STEEL-R COMPETENCE MATH-MODEL

USES MULTIPLE EXERCISE OUTCOME DATA TO COMPUTE COMPETENCE LEVEL



COMMANDER ASSESSMENT

Post Training Assessment / Review



- Alpha Company Commander and Platoon Leader still has authority to make final assessment on SGT Meers' Fire-Team training.
- Can now make assessments and future training decisions based on actual data of training outcomes.
- Can update guidance and expectations from other units' performance.
- Can update guidance based on degree of fidelity and accuracy of simulation.



Commander / Leader Review / Assessment in Dashboard Demo

STEEL-R Navigator (Working)



- OC/T inputs that they want this unit to target specific competencies at specific levels.
- Navigator uses Learner Profile from Dashboard.
- Navigator computes optimal scenario for OC/T input, accounting for:
 - Zone of Proximal Development of soldiers/team.
 - Spaced repetition.
 - Skill decay.
 - Interleaved Practice.
 - Commander's Intent.
 - Stress and Difficulty.
- Navigator uses optimal scenario definition to search Experience Index for existing scenarios, and presents to the OC/T the option to create a new scenario or use an existing scenario.

PLANNING / DESIGN, DEVELOP, IMPLEMENT TRAINING





- During planning/scheduling it's noted that one of the events doesn't have an available experience Training Support Package (xTSP) for the competency level (practiced) of team and conditions needed (crawl-level) for PVT Stephens.
- SGT Meers is assigned to create a new exercise XTSP using the STEELR Experience Design Tool (XDT).
- SGT Meers is only *practiced* in Experience Design but the process is easy enough he is able to experience creating the needed xTSP.
 - If needed SGT Meers can get local/remote assistance from a *Proficient* Army exercise design support.
 - Counts towards SGT Meers' Experience Design competence rating.

Experience Training Support Package?

XTSP (Experience Object)



- Common standard to define tasks, condition stimulus, automated measures and measurement data sources across training environments
 - so longitudinal competence can be calculated with high validity
- Used with data reconstruction to "capture" real exercises or event, which can then be "re-experienced" by others in a synthetic environment.
- Provides different "levers" of difficulty to be adjusted to match ability of the trainees using exercise without trainer intervention (ZPD).
- Automates the setup of synthetic environments, assessment tools, and gathering of needed training resources
- Modular: can contain multiple missions, environments, and sub-XTSPs for simultaneous collective training events

Experience Levers of Difficulty



Difficulty:

A rolled-up state that is set by creating or selecting strategies and/or scripts that have metadata with one of these three-levels:

- Hard
- Moderate
- Easy

Created with scripts that produce actor interventions and adaptations.

- Number of Problems
- Ambiguity of Information/Situation
- Complexity of Problems
- Volatility of Situation
- Physical effort required
- Cognitive effort required

Experience Design Tool (XDT)

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- Exercise design requirements automatically recommended by STEEL-R Navigator. Can over-ride
- [Future] lay-down function will place OPFOR units randomly or in recorded intelligence / past positions (re-experience)
- BLUFOR can be started in specified or random locations
- Add / Change overlays for mission tactical or automatic assessment trigger layers
- Pre-test Experience with Training Application



XDT / XTSP Development Demo

Looking at Placements through Different Media



- Allows designer or reviewers to observe or play-back experience and mission, as well as adjust player / OPFOR placement, and create assessment triggers, from different perspectives using different devices.
 - Using Battlespace Visualization and Indication product

Add / Change XTSP Triggers, Strategies, and Automated Assessment Parameters



- Add / Change XTSP:
 - Automated Assessment types and criteria
 - xEvent start and end triggers
 - Strategies to prompt performance and set conditions (difficulty) in an experience



XDT -> GIFT Interface Demo



Any Questions?

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