APTIMA®
Human-Centered Engineering®

SONALYSTS

Team-based Advanced Resilience Accelerator (TARA)

March 9, 2021

Kristy Kay, M.S.

The views of the author expressed herein do not necessarily represent those of the U.S. Navy or Department of Defense (DoD). Presentation of this material does not constitute or imply its endorsement, recommendation, or favoring by the DoD. Distribution Statement A – Approved for public release; distribution is unlimited, as submitted under NAVAIR Public Release Authorization YY-20-ORL037.

Support for this Work

SPONSORS

This work was made possible through Small Business Innovation Research (SBIR) funding from the Naval Air Warfare Center Training Systems Division (NAWCTSD)

END-USERS

And with support from Naval Submarine School (NSS) and Submarine Learning Center (SLC) leadership & instructors from the Naval Submarine Base New London.

APTIMA®
Human-Centered Engineering®

Outline

1. Why are we doing this? (Motivation & Goals)
2. How will we accomplish it? (Technical Approach)
3. What did we learn? (Training Environment) And, what did we plan? (Envisioned Enhancements)
4. What did we create? Team-based Advanced Resilience Accelerator (TARA)
5. How well does it work? (Usability Evaluation)
6. What's next? (Current Status & Big Picture Impact)

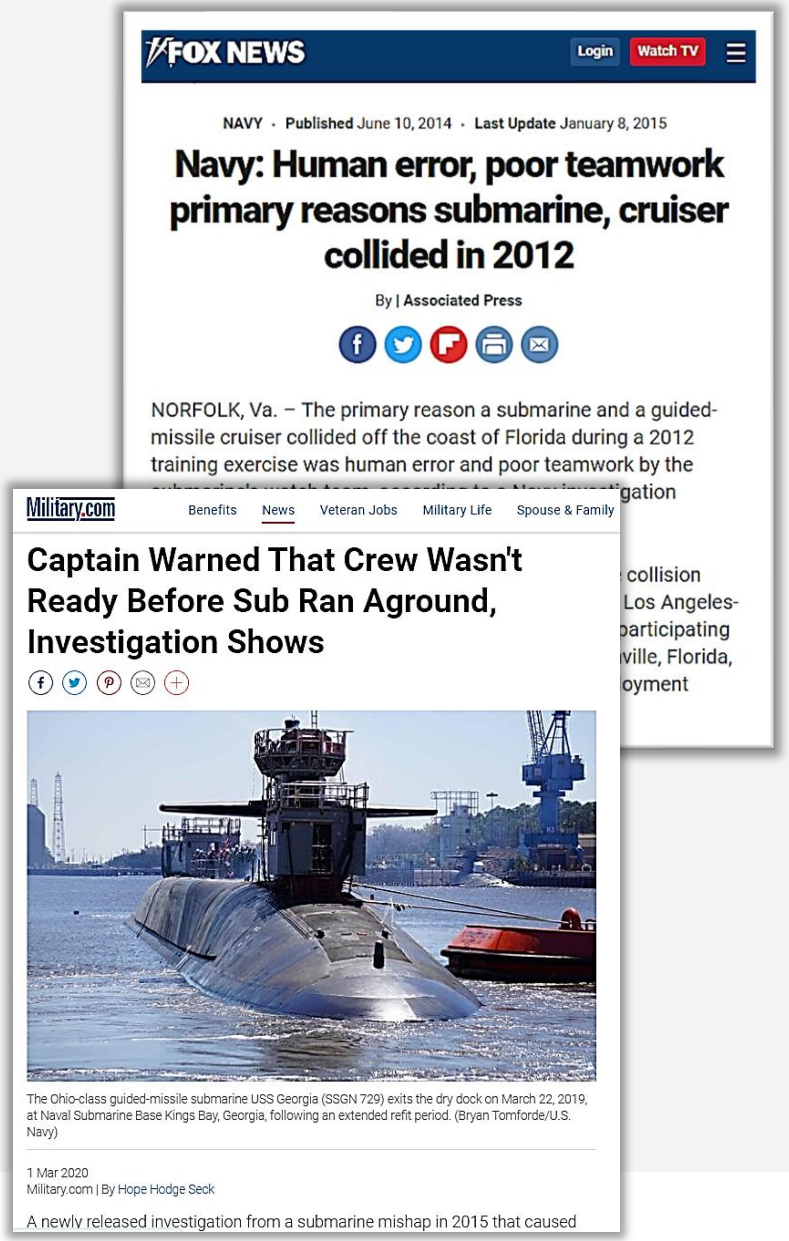
APTIMA®
Human-Centered Engineering®

Motivation: Resilient Teams

Expert, or resilient, teams have a **deep and shared understanding** of the situation, their own roles, and those of the other team members.

This allows them to **anticipate needs** and **coordinate implicitly**, facilitating quicker decision-making.

With these skills, resilient teams are better **poised to recognize danger**, seize opportunity during times of uncertainty, and **bounce back from unexpected or disruptive events**.


FOX NEWS Login Watch TV

NAVY · Published June 10, 2014 · Last Update January 8, 2015

Navy: Human error, poor teamwork primary reasons submarine, cruiser collided in 2012

By | Associated Press

NORFOLK, Va. – The primary reason a submarine and a guided-missile cruiser collided off the coast of Florida during a 2012 training exercise was human error and poor teamwork by the

Military.com Benefits News Veteran Jobs Military Life Spouse & Family

Captain Warned That Crew Wasn't Ready Before Sub Ran Aground, Investigation Shows

The Ohio-class guided-missile submarine USS Georgia (SSGN 729) exits the dry dock on March 22, 2019, at Naval Submarine Base Kings Bay, Georgia, following an extended refit period. (Bryan Tomforde/U.S. Navy)

1 Mar 2020
Military.com | By Hope Hodge Seck

A newly released investigation from a submarine mishap in 2015 that caused

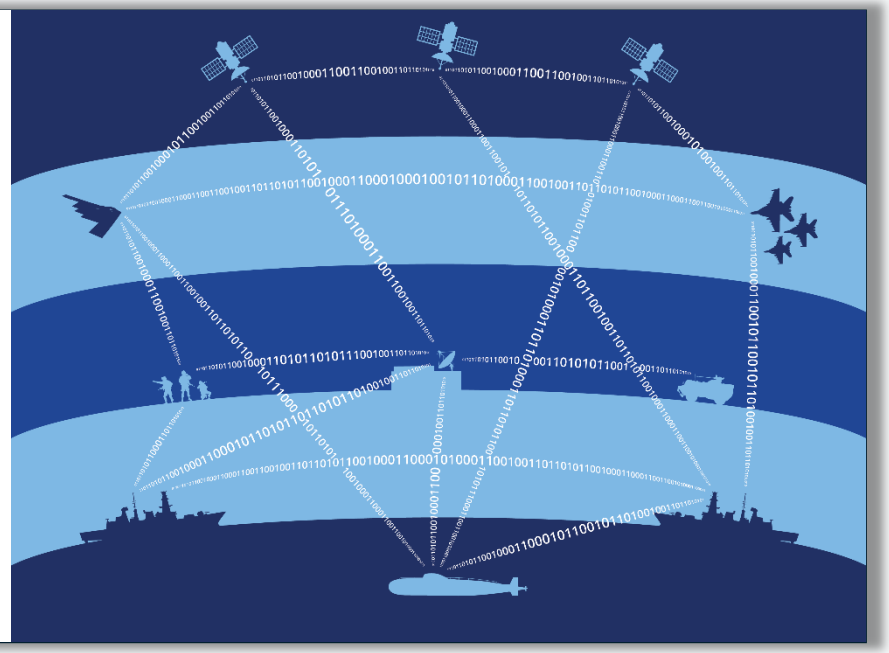
APTIMA®
Human-Centered Engineering®

Goal: Mission Readiness

Resilient teamwork behaviors are critical for safe and effective submarine operation and tactical maneuvering.

These non-technical behaviors **tend to be learned implicitly through experience** during training or at sea.

More broadly, beyond submarine team training, support for the development of resilient teams will positively impact overall **mission readiness and performance during multi-domain operations**.



Approach

1. Learn about current team training practices
2. Identify and prioritize areas for improvement
3. Leverage stakeholder feedback throughout design, development, and evaluation iterations
4. Harden system for use in classified environment
5. Deliver system to training environment for in situ use (during an interim evaluation period)

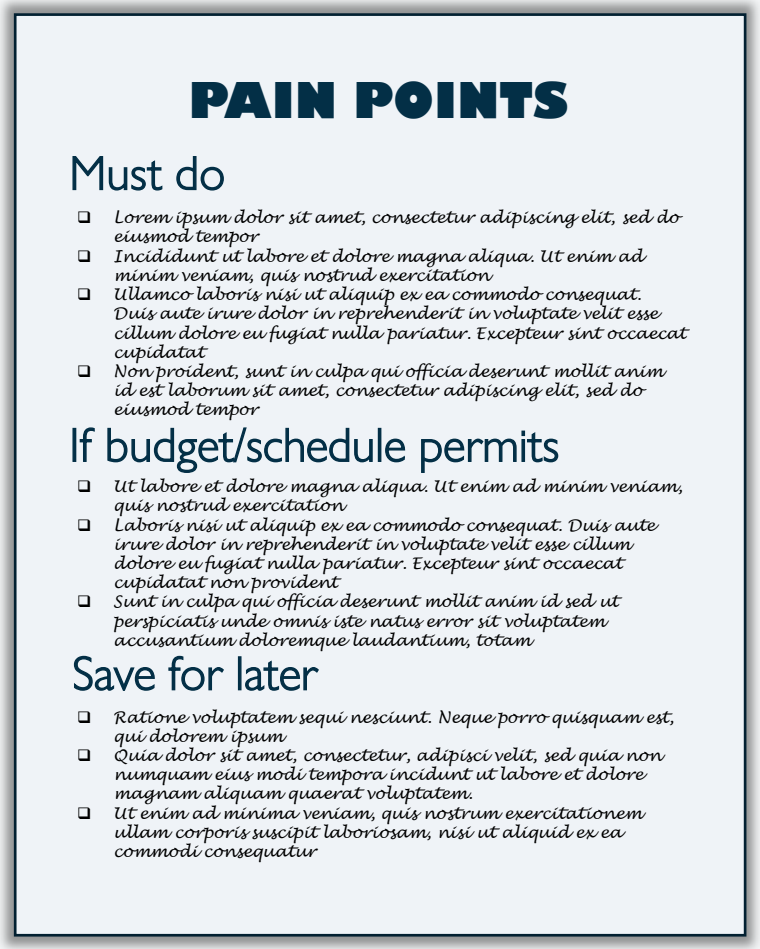
INTERVIEWS

OBSERVATIONS

APTIMA®
Human-Centered Engineering®

Approach

1. Learn about current team training practices
2. Identify and prioritize areas for improvement
3. Leverage stakeholder feedback throughout design, development, and evaluation iterations
4. Harden system for use in classified environment
5. Deliver system to training environment for in situ use (during an interim evaluation period)



PAIN POINTS

Must do

- Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor
- Incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation
- Ullamco laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat
- Non proident, sunt in culpa qui officia deserunt mollit anim id est laborum sit amet, consectetur adipiscing elit, sed do eiusmod tempor

If budget/schedule permits

- Ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation
- Laboris nisi ut aliquip ex ea commodo consequat. Duis aute irure dolor in reprehenderit in voluptate velit esse cillum dolore eu fugiat nulla pariatur. Excepteur sint occaecat cupidatat non provident
- Sunt in culpa qui officia deserunt mollit anim id sed ut perspiciatis unde omnis iste natus error sit voluptatem accusantium doloremque laudantium, totam

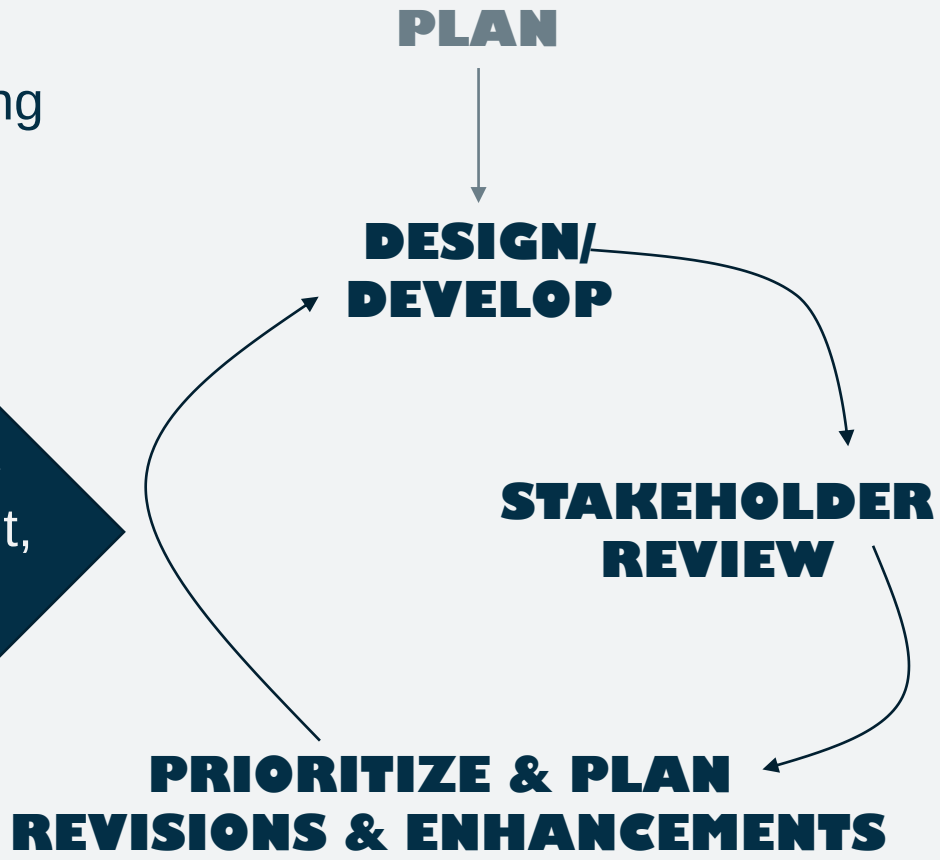
Save for later

- Ratione voluptatem sequi nesciunt. Neque porro quisquam est, qui dolorem ipsum
- Quia dolor sit amet, consectetur, adipisci velit, sed quia non numquam eius modi tempora incidunt ut labore et dolore magnam aliquam quaerat voluptatem.
- Ut enim ad minima veniam, quis nostrum exercitationem ullam corporis suscipit laboriosam, nisi ut aliquid ex ea commodi consequatur

APTIMA®
Human-Centered Engineering®

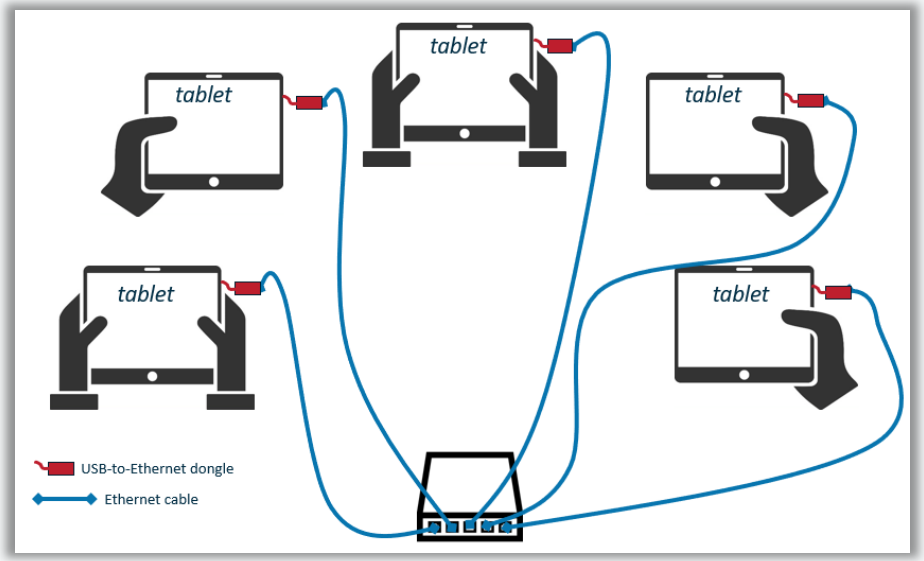
Approach

1. Learn about current team training practices
2. Identify and prioritize areas for improvement
3. Leverage stakeholder feedback throughout design, development, and evaluation iterations
4. Harden system for use in classified environment
5. Deliver system to training environment for in situ use (during an interim evaluation period)



Approach

1. Learn about current team training practices
2. Identify and prioritize areas for improvement
3. Leverage stakeholder feedback throughout design, development, and evaluation iterations
4. Harden system for use in classified environment
5. Deliver system to training environment for in situ use (during an interim evaluation period)



STANDALONE NETWORK

Approach

1. Learn about current team training practices
2. Identify and prioritize areas for improvement
3. Leverage stakeholder feedback throughout design, development, and evaluation iterations
4. Harden system for use in classified environment
5. Deliver system to training environment for in situ use (during an interim evaluation period)

IN SITU EVALUATION

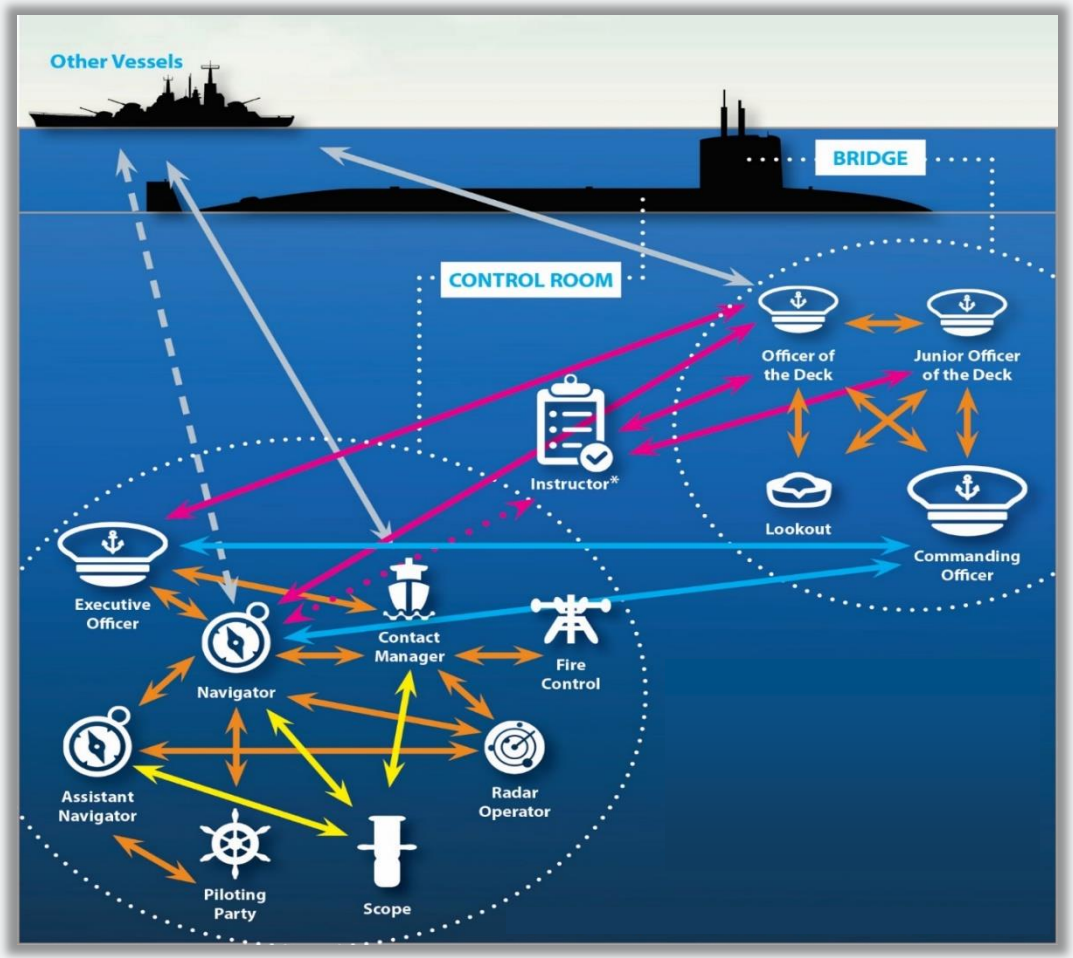
APTIMA®
Human-Centered Engineering®

Context: Training Environment

Integrated Submarine Piloting and Navigation (ISPAN) Trainer

Provides the necessary training to submarine crews in order to safely navigate submarines into and out of busy ports

- Scenario-driven
- Simulation-based
- Team training



What did we learn about the training process in this environment?

PLAN: Training Officers use an application (TSU) to schedule teams for training, selecting specific training objectives

PREP: Instructors print sheets with training objectives & tailor scenario for training

OBSERVE: Instructors reference printouts & write notes as they observe team behavior during scenarios

DEBRIEF: Instructors & trainees participate in reviews of performance, referencing hand-written notes and limited screen replay functions

REPORT: Later, Instructors enter scores for each training objective into a record keeping system (CTQS) for qualifications tracking

DATA ANALYSIS & LIFELONG LEARNING: Currently, there are no simple tools for evaluating training trends, etc.

Team-based Advanced Resilience Accelerator (TARA)

TARA is a combination of two component applications:

SubmarineSPOTLITE

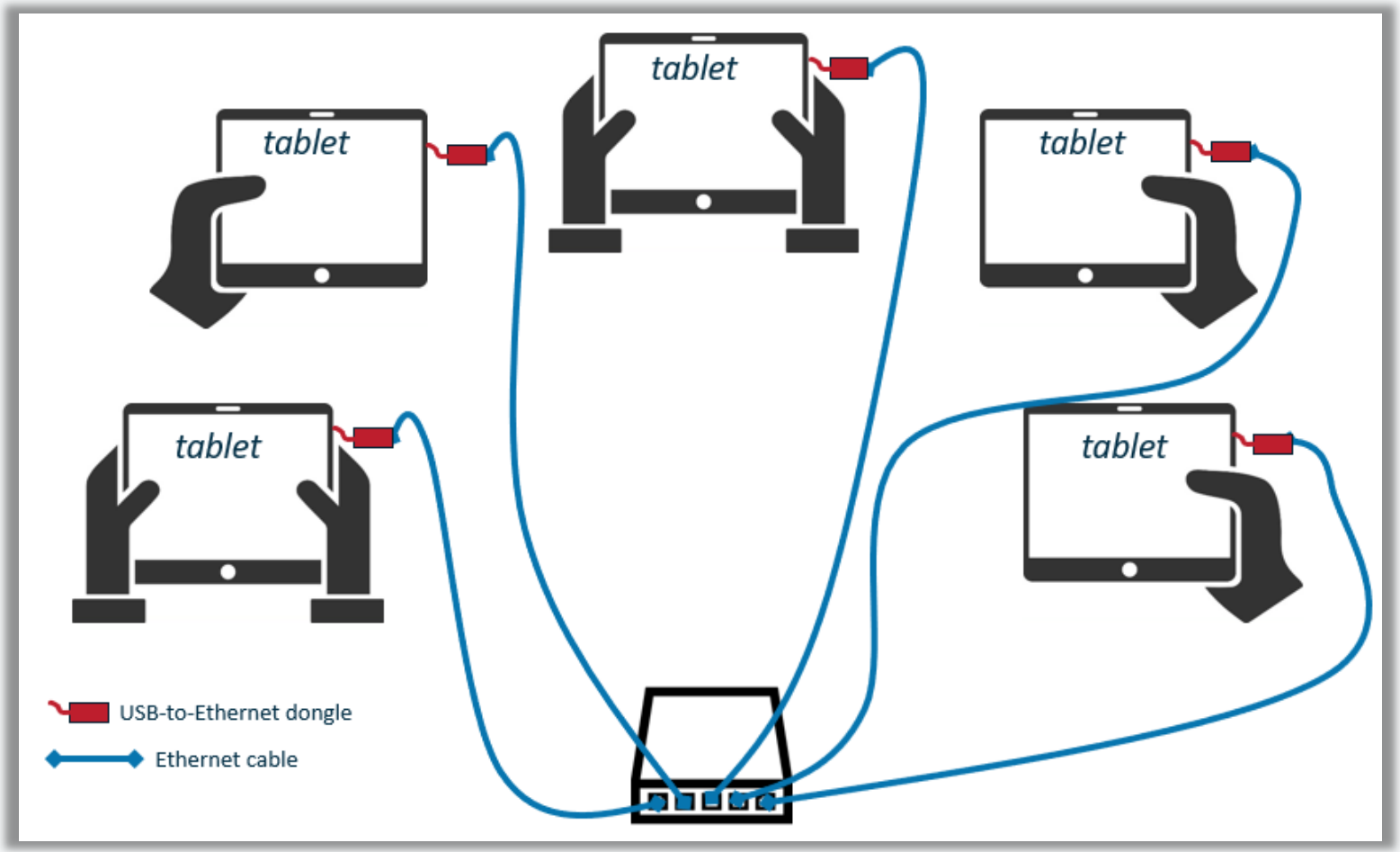
Observational assessment software

Learning Locker

Learner Record Store (LRS) saves longitudinal performance data in xAPI format

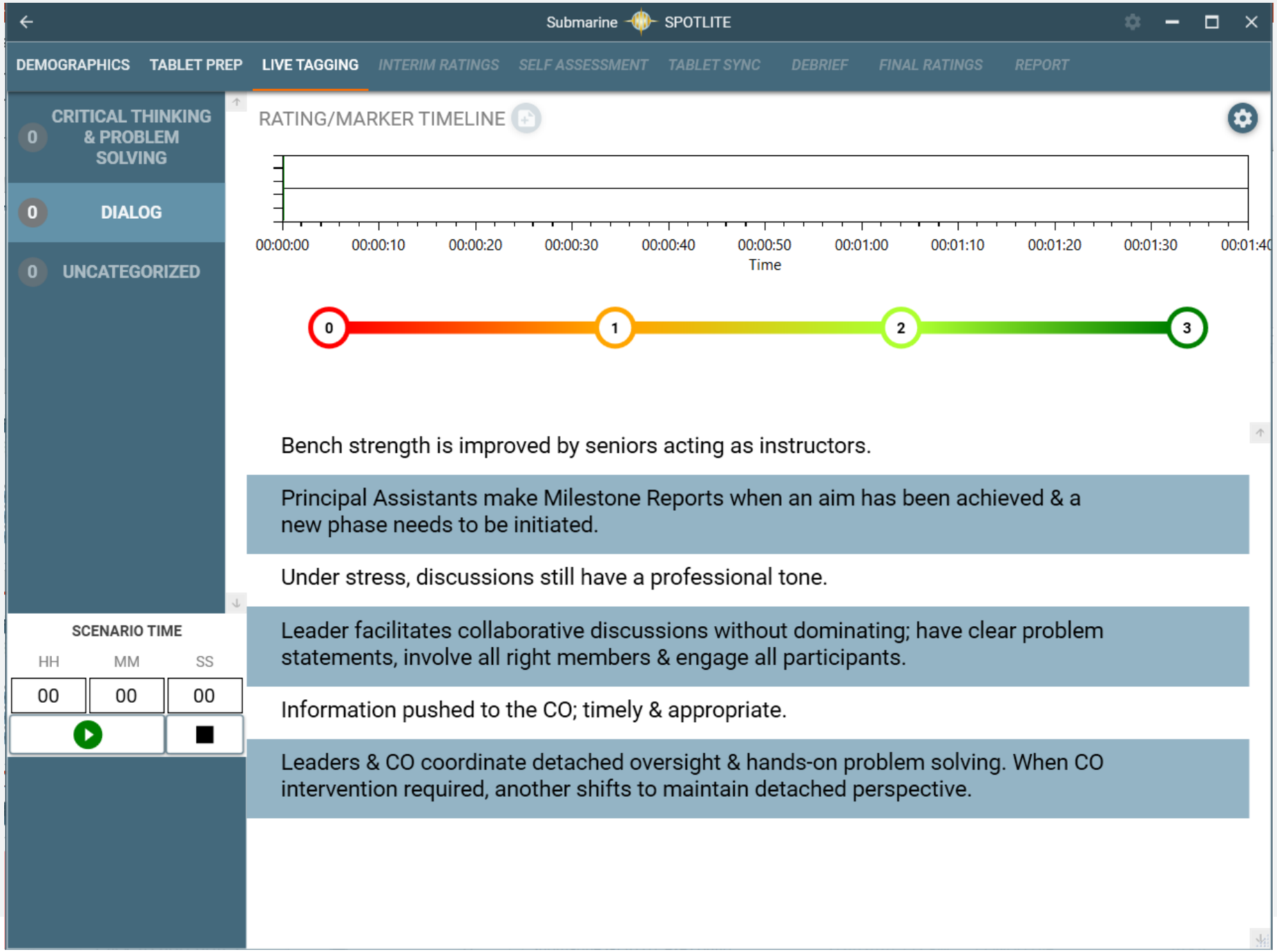
APTIMA®
Human-Centered Engineering®

Team-based Advanced Resilience Accelerator (TARA)



STANDALONE NETWORK

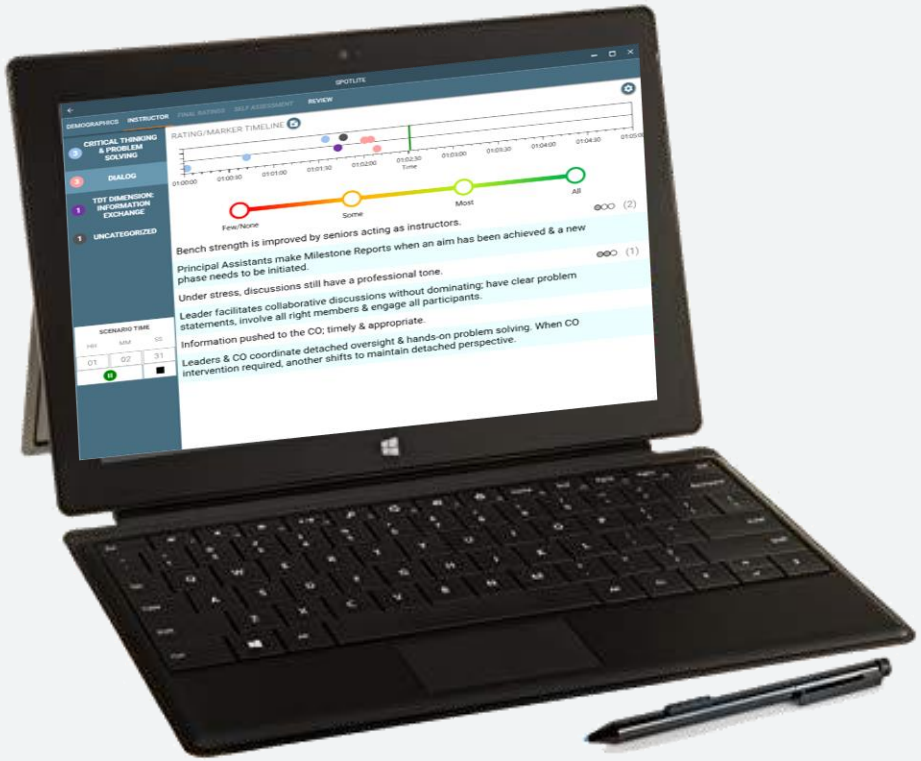
Current	What were we able to accomplish?
PLAN: Training Officers use an application (TSU) to schedule teams for training, selecting specific training objectives	**PREP:** Training objectives present in application; no printing necessary **SET EXPECTATIONS:** teams review objectives together
PREP: Instructors print sheets with training objectives & tailor scenario for training	
OBSERVE: Instructors reference printouts & write notes as they observe team behavior during scenarios	
DEBRIEF: Instructors & trainees participate in reviews of performance, referencing hand-written notes and limited screen replay functions	
REPORT: Later, Instructors enter scores for each training objective into a record keeping system (CTQS) for qualifications tracking	
DATA ANALYSIS & LIFELONG LEARNING: Currently, there are no simple tools for evaluating training trends, etc.	



APTIMA®
Human-Centered Engineering®

Team-based Advanced Resilience Accelerator (TARA)

Tablet-based form-factor enables instructors to move through the training environment during the scenario, quickly rating behaviors and annotating ratings with notes for use during debrief

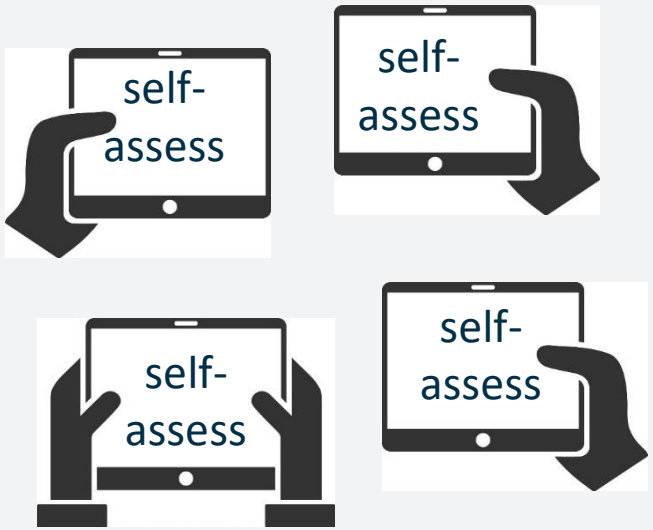


Current	What were we able to accomplish?
PLAN: Training Officers use an application (TSU) to schedule teams for training, selecting specific training objectives	**PREP:** Training objectives present in application; no printing necessary **SET EXPECTATIONS:** teams review objectives together
PREP: Instructors print sheets with training objectives & tailor scenario for training	
OBSERVE: Instructors reference printouts & write notes as they observe team behavior during scenarios	**OBSERVE:** Instructors note real-time observations of team behavior and then finalize scores on a tablet; teams practice **SELF-ASSESSMESNT** skills
DEBRIEF: Instructors & trainees participate in reviews of performance, referencing hand-written notes and limited screen replay functions	
REPORT: Later, Instructors enter scores for each training objective into a record keeping system (CTQS) for qualifications tracking	
DATA ANALYSIS & LIFELONG LEARNING: Currently, there are no simple tools for evaluating training trends, etc.	

Observational Assessment Tool

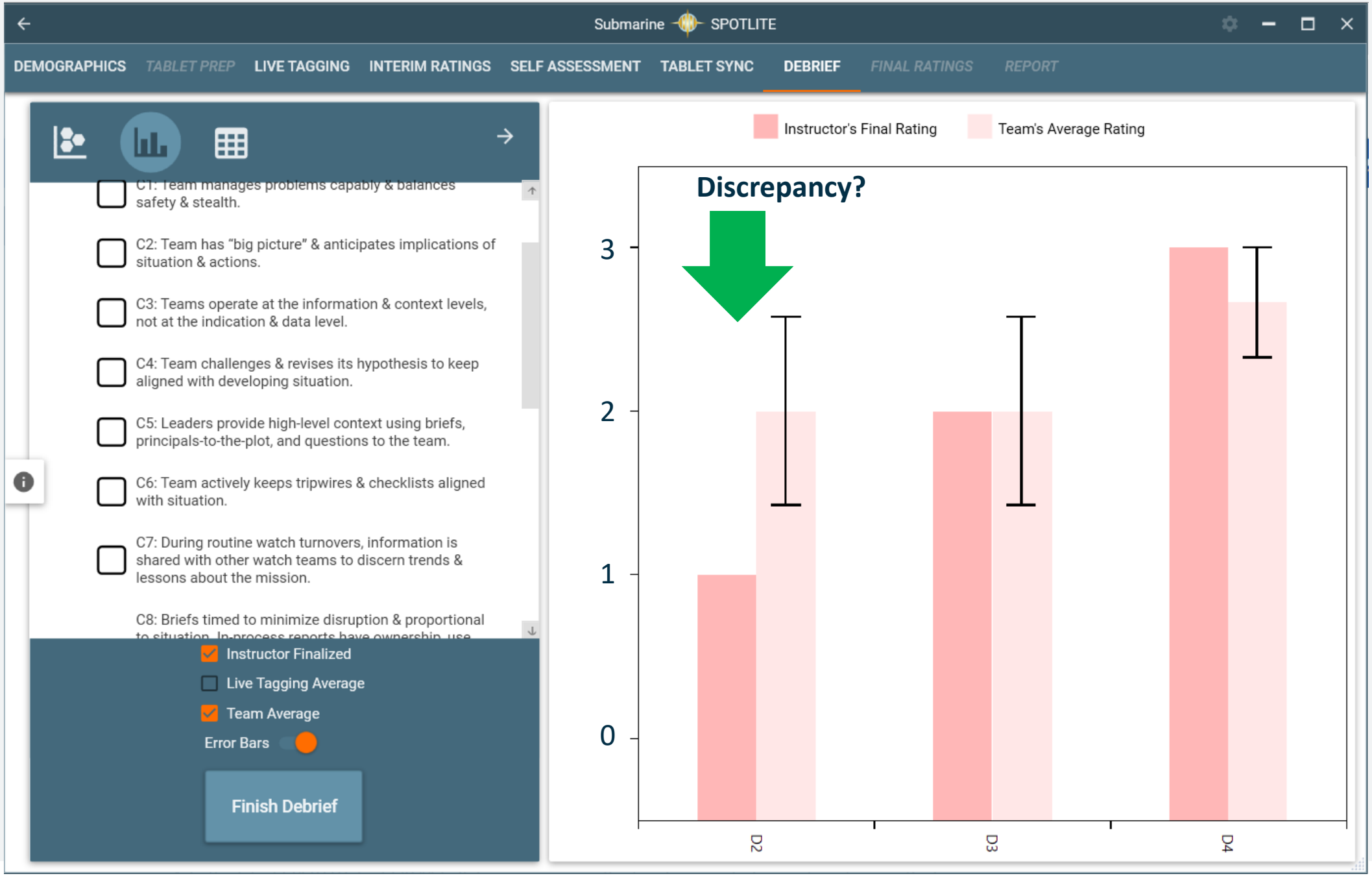
Following the completion of the scenario…

- While trainees each grab a tablet and begin entering their self-assessment ratings of how the team performed on each of the training objectives
- Instructors review, edit, and add to their observational ratings



Next, tablets are synchronized through the standalone network to ensure identical data on each one

Current	What were we able to accomplish?
PLAN: Training Officers use an application (TSU) to schedule teams for training, selecting specific training objectives	**PREP:** Training objectives present in application; no printing necessary **SET EXPECTATIONS:** teams review objectives together
PREP: Instructors print sheets with training objectives & tailor scenario for training	
OBSERVE: Instructors reference printouts & write notes as they observe team behavior during scenarios	**OBSERVE:** Instructors note real-time observations of team behavior and then finalize scores on a tablet; teams practice **SELF-ASSESSMESNT** skills
DEBRIEF: Instructors & trainees participate in reviews of performance, referencing hand-written notes and limited screen replay functions	**DEBRIEF:** Instructors & trainees participate in reviews, referencing **quantitative visualizations of performance**
REPORT: Later, Instructors enter scores for each training objective into a record keeping system (CTQS) for qualifications tracking	
DATA ANALYSIS & LIFELONG LEARNING: Currently, there are no simple tools for evaluating training trends, etc.	



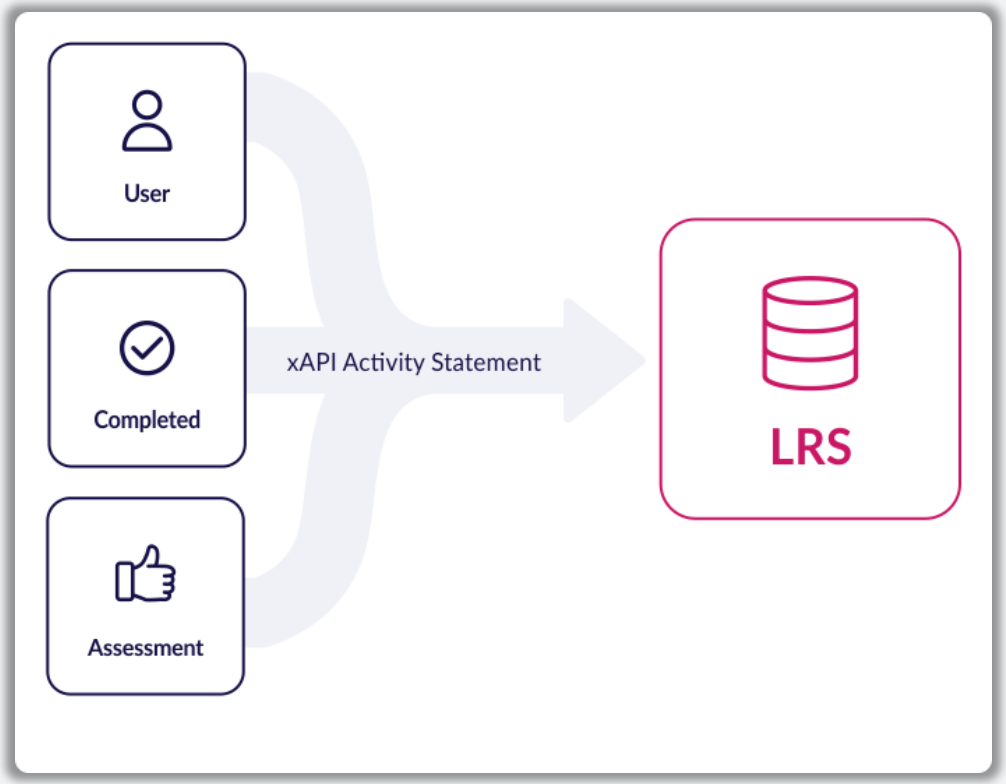
Current	What were we able to accomplish?
PLAN: Training Officers use an application (TSU) to schedule teams for training, selecting specific training objectives	**PREP:** Training objectives present in application; no printing necessary **SET EXPECTATIONS:** teams review objectives together
PREP: Instructors print sheets with training objectives & tailor scenario for training	
OBSERVE: Instructors reference printouts & write notes as they observe team behavior during scenarios	**OBSERVE:** Instructors note real-time observations of team behavior and then finalize scores on a tablet; teams practice **SELF-ASSESSMESNT** skills
DEBRIEF: Instructors & trainees participate in reviews of performance, referencing hand-written notes and limited screen replay functions	**DEBRIEF:** Instructors & trainees participate in reviews, referencing **quantitative visualizations of performance**
REPORT: Later, Instructors enter scores for each training objective into a record keeping system (CTQS) for qualifications tracking	**REPORT:** No manual data-entry; final scores for training objectives are saved automatically into record systems for **long term tracking**
DATA ANALYSIS & LIFELONG LEARNING: Currently, there are no simple tools for evaluating training trends, etc.	**DATA ANALYSIS & LIFELONG LEARNING:** xAPI formatted data enables exploratory analyses of training trends & supports integration with other systems that capture training events & experiential learning

Team-based Advanced Resilience Accelerator (TARA)

Following the completion of the debrief…

- Instructors finalize their observational ratings, making updates based on debrief discussions

Lastly, observational assessment data are saved in xAPI format in the Learning Locker database to facilitate future integration with other performance tracking systems



xAPI FORMAT

Expected Benefits of TARA

- **Enhance training transparency**: setting expectations at the outset when instructors and learners can preview training objectives during pre-briefs
- **Increase the accuracy and ease** with which instructors evaluate learners' performance in real time
- Provide trainees **practice with self-assessment**
- **Facilitate learning** during debriefs with immediately available graphical visualizations of both self-assessment and actual performance ratings

APTIMA®
Human-Centered Engineering®

Usability Evaluation

Objective

Learn from novices (i.e., those who have never seen the tool) about what aspects of the software are intuitive vs. confusing

Participants

Current and retired submarine team instructors (n=6)

Protocol

Participants were given a brief overview of the purpose of the software, and then performed a series of tasks with minimal instructions or prompting; lastly, they completed a survey

Results

The evaluation resulted in a number of fixes and enhancements, the majority of which have been implemented; see next slides for survey results

APTIMA®
Human-Centered Engineering®

Usability Evaluation Feedback

RATING SCALE:

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Usability Statement	Mean	Standard Deviation
I felt confident using the tool without additional help	4.17	0.41
I would use this tool in my job	4.0	0.63
The tool would help me do my job	4.17	0.41
The tool would help improve team training evaluation	4.33	0.52
The tool would help Submariners develop resilient team skills to be successful as a team	3.83	0.41
I would recommend the tool to others	4.17	0.41

Current Status

At Technology Readiness Level (TRL) 7, TARA received interim approval for use in the ISPAN environment during an **experimental evaluation period**.

During this time, instructors will use TARA on their own during team training events.

Next steps

- Receive feedback from NSS instructors and leadership
- If there is continued interest in this tool, seek out mechanisms for further development and integration with other training-related systems (e.g., TSU, CTQS)

Big Picture Impact

- TARA will **streamline team training and assessment processes**
- Instructors will spend more time observing team behaviors and providing helpful, guiding feedback, thereby **speeding up the development of resilient teams**
- TARA can be **easily adapted to other environments**, e.g., wherever learners must satisfy (or surpass) detailed training objectives to qualify for deployment

APTIMA®
Human-Centered Engineering®

Kristy Kay, M.S., Scientist
kkay@aptima.com
858-229-5337

Lisa Lucia, Ph.D., Scientist
llucia@aptima.com
781-935-3966 x205

Aptima, Inc.
12 Gill St #1400, Woburn, MA 01801
www.aptima.com