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Iterative Development of the GIFT Wrap Authoring Tool

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Background

- GIFT consumes raw data → Domain Module for assessment purposes
- Domain Module uses raw data to compute a performance state on a set of defined concepts
 - Condition Classes designate performance as **at-, above-, and below-expectation** for concept being assessed
 - Performance state is combined with learner information (i.e., individual differences) to inform the Pedagogical Model for a strategy selection
- Challenge
 - Establishing the necessary assessments required to capture appropriate performance states that associate with the objectives of the training event
- Proposed Solution
 - User-centered design approaches are being applied to current architectural components with the intent of providing training developers with intuitive tools to configure these assessments themselves

Authoring Challenges

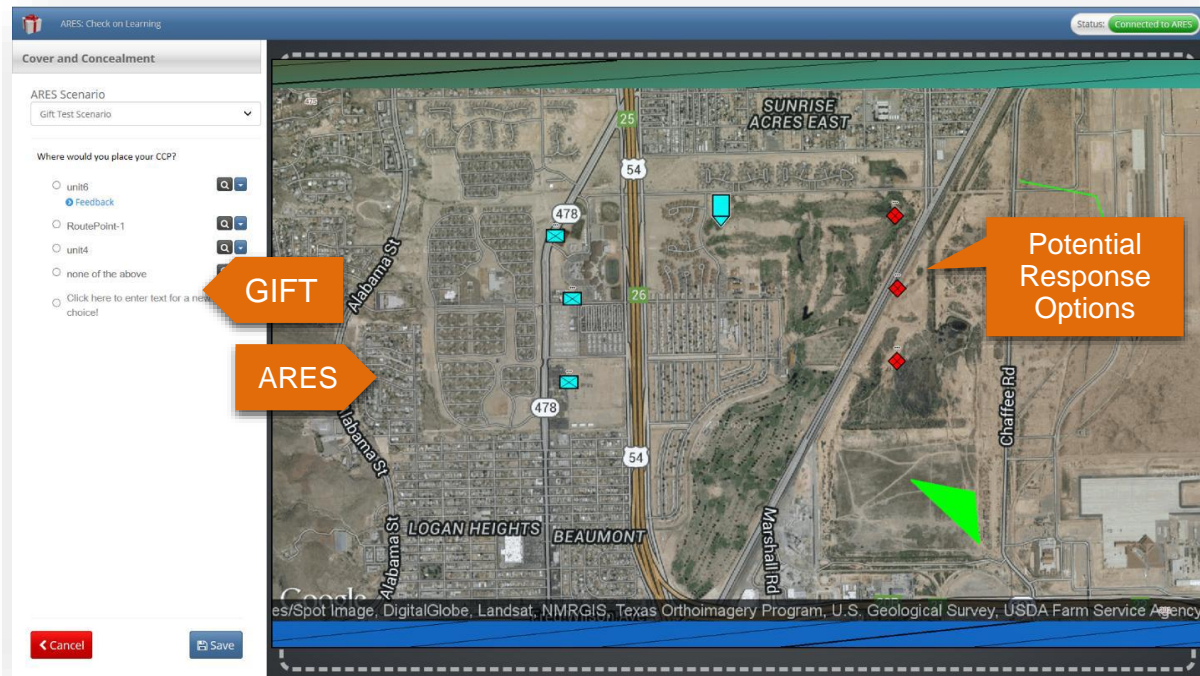
- Authoring the DKF
 - DAT developed to support authoring adaptive training
 - Intricacies of the system have proven too complex for average users
 - Nested hierarchies, interrelationships among components (assessments, strategies, triggers)
- Disconnect between GIFT and Training Application's content creation tools
 - Work with GIFT (DAT) and TA separately
 - No integration across authoring tools

Overcoming Authoring Challenges

- **GIFT Wrap**
 - Purposely designed to overcome the challenges associated with authoring RTAs by providing users with an integrated, user-friendly authoring tool.
- **1st Generation**
 - Initial step towards addressing integration with TAs
 - Provided user with a tool that allowed them to author tutoring content while simultaneously interacting with the TA's content creation tools

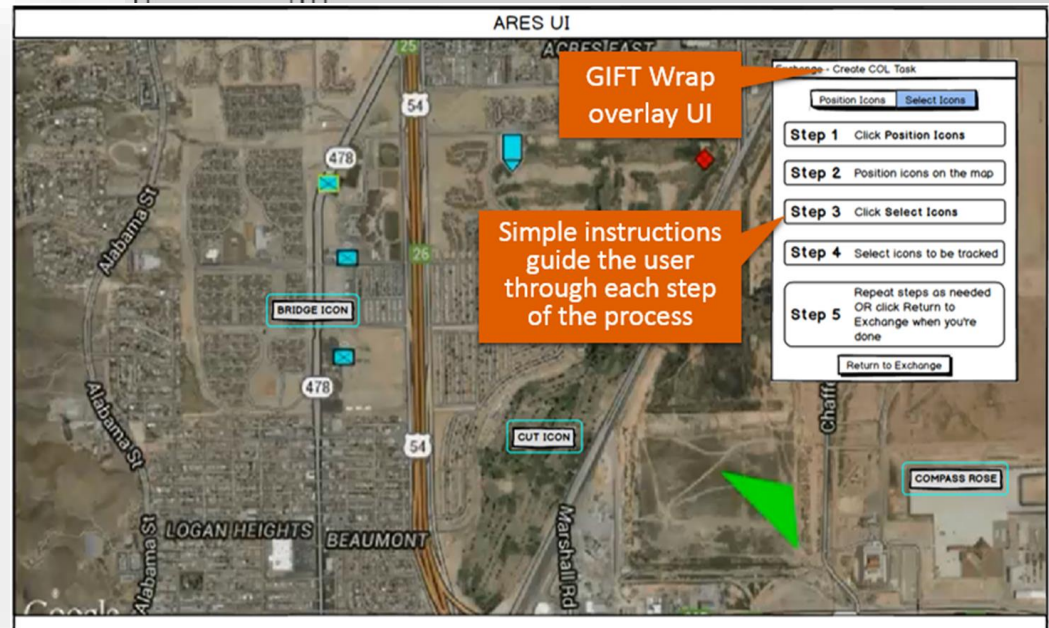
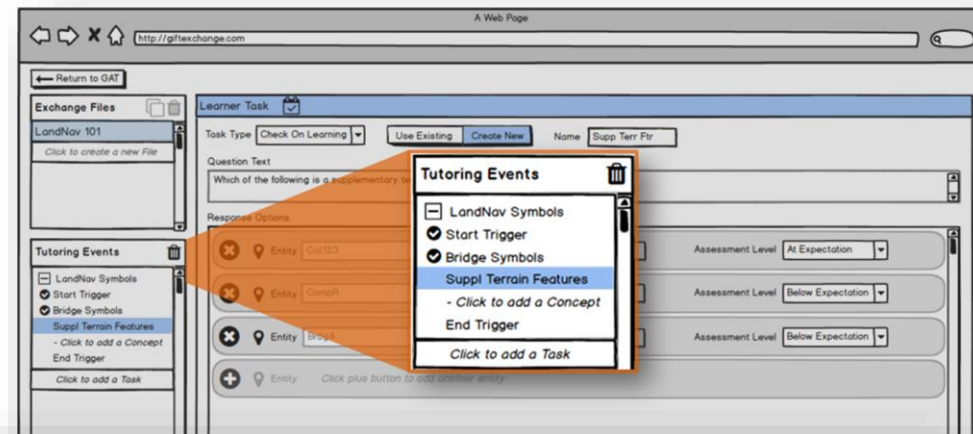
1st Generation

- Integrated with ARES
- Create COL survey questions
- Eliminated the GIFT-TA content creation tools disconnect



2nd Generation

- Redesigned UI for authoring DKF → replace the DAT
- “Blended authoring environment” – author RTAs directly within the context of a TA’s content creation tools
- Overlay UI – rapidly switch back to the main GIFT Wrap UI and configure the rest of the DKF



3rd Generation GIFT Wrap

- Incorporating DAT Functionality
 - Child Concepts
 - Nested up to three layers deep allowing training developers the flexibility to assess at different levels of granularity
 - Multiple strategies for state transitions and/or assessment levels for a given Condition Class
 - Time delays for Task triggers (start/end)
 - Better control the pace and timing of tutoring events

The screenshot shows a web-based interface for configuring a course. At the top, there is a browser address bar with the URL `http://192.168.1.157:8080/exchange/#home`. Below the address bar are navigation buttons: "Return to GAT" and "Export Course Object".


The interface is divided into several sections:

- GIFT Wrap Files:** A list containing "LandNav 101".
- Tutoring Events:** A list of events including "Task 1", "Start Trigger", "Concept 10", "Concept 11", "Concept 12", "Concept 2.0", and "End Trigger". "Concept 10" is highlighted in blue.
- Strategies:** A section with a blue header. It contains a list of strategies: "Scenario Adaptation" and "Survey". Below the list is a button labeled "Add another strategy". An orange callout box labeled "Multiple Strategies" points to this section.
- Strategy Triggering Conditions:** A form with the following fields:
 - Performance on Concept 1.0 transitioned from: to
 - Select Strategy Type:
 - Select Survey Context:
 - Select Survey:
- Questions to Assess:** A section with two question cards. The first card has the text "How well do you think you know the material you just..." and four answer options: Answer A (At Expectation), Answer B, Answer C, and Answer D. The second card has the text "Survey question text goes here...". Each card has "Use" and "Skip" buttons.

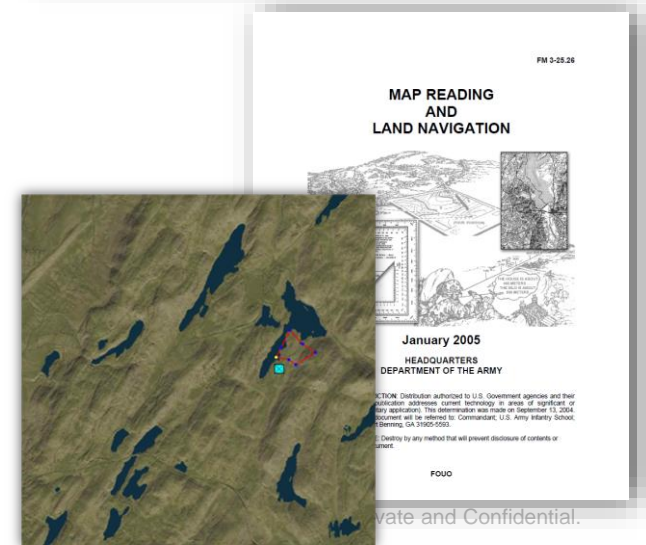
Nested Concepts

Multiple Strategies

Extending the Blended Authoring Experience

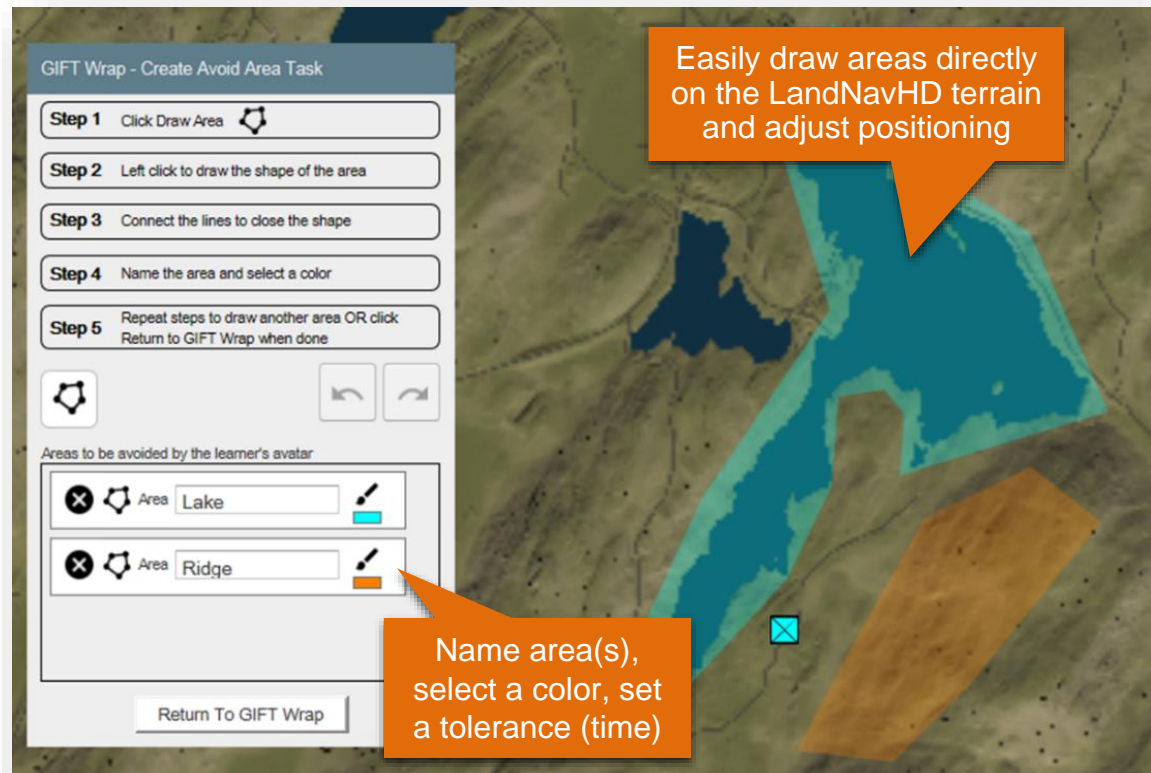
- LandNavHD Unity game
 - Integrated with the GIFT  unity plugin to
 - New event handlers created in the Unity – send messages to GIFT used for RTAs
- RTAs were created for LandNavHD
 - Continued landnav training use case
 - Avoid Area, Follow Path, Locate Navigation Points
- Overlay UI for new RTAs within the Land-NavHD environment
 - LandNavHD lacks content creation tools
 - Used a top-down image of the terrain to simulate the functionality

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Avoid Area


- Condition Class checks whether a specific entity avoided an area in the VE
- Used to assess the learner's ability to move by terrain association and/or dead reckoning while avoiding certain obstacles, areas, terrain features, etc.
- Created for landnav, generalizable to numerous scenarios relating to zones of interest and trainee location within that interacting space



Follow Path

- Condition Class checks whether an entity traveled along a series of connected straight line paths in the VE within a set of thresholds for deviation
- Used to assess a learner's ability to move by dead reckoning, point-to-point land navigation

GIFT Wrap - Create Follow Path Task

Step 1 Click Draw Path 

Step 2 Left click to add path segments

Step 3 Press Enter to finish adding segments

Step 4 Adjust the tolerance as needed

Step 5 Click Return to GIFT Wrap when done

Path to be followed by the learner's avatar

| | | | |
|-----------|-----------|----|-------|
| Segment 1 | Tolerance | 80 | Units |
| Segment 2 | Tolerance | 80 | Units |

Return To GIFT Wrap

Easily draw path directly on the LandNavHD terrain and adjust positioning

Set a tolerance (distance)

Locate Navigation Points

- Condition Class checks whether an entity reached the location of a specific location (coordinate) in the VE within a set threshold
- Used to assess the learner's ability to navigate to specified locations in the VE

GIFT Wrap - Create Locate Navigation Point Task

Step 1 Click: Add a Point

Step 2 Click on the map in the desired location and reposition as needed

Step 3 Name the point and set the tolerance

Step 4 Repeat steps to add another point OR click Return to GIFT Wrap when done

Points to be Located by the Learner

| | |
|---------|---|
| Point A | Tolerance: <input type="text" value="150"/> Units |
| Point B | Tolerance: <input type="text" value="150"/> Units |
| Point C | Tolerance: <input type="text" value="150"/> Units |

Return To GIFT

Easily drop points directly on the LandNavHD terrain and adjust positioning

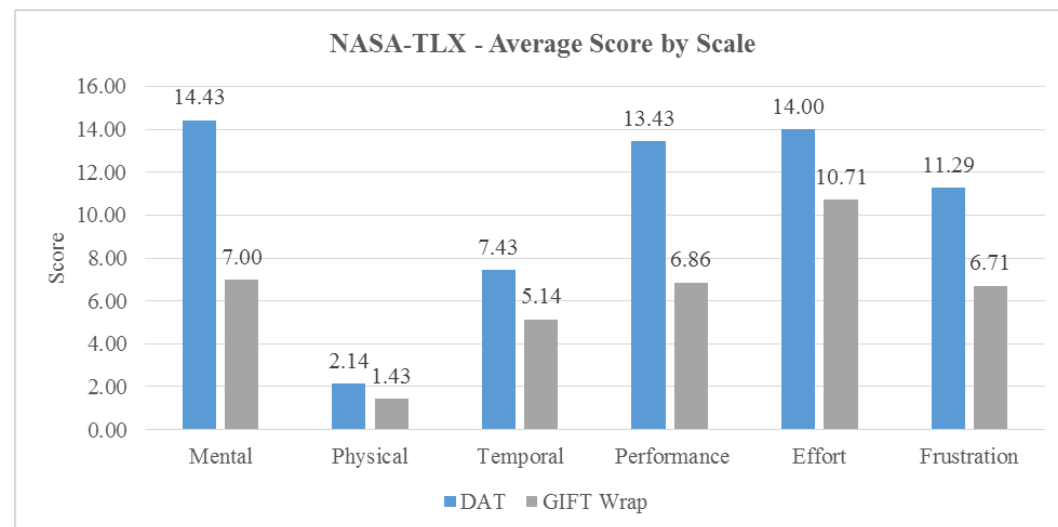
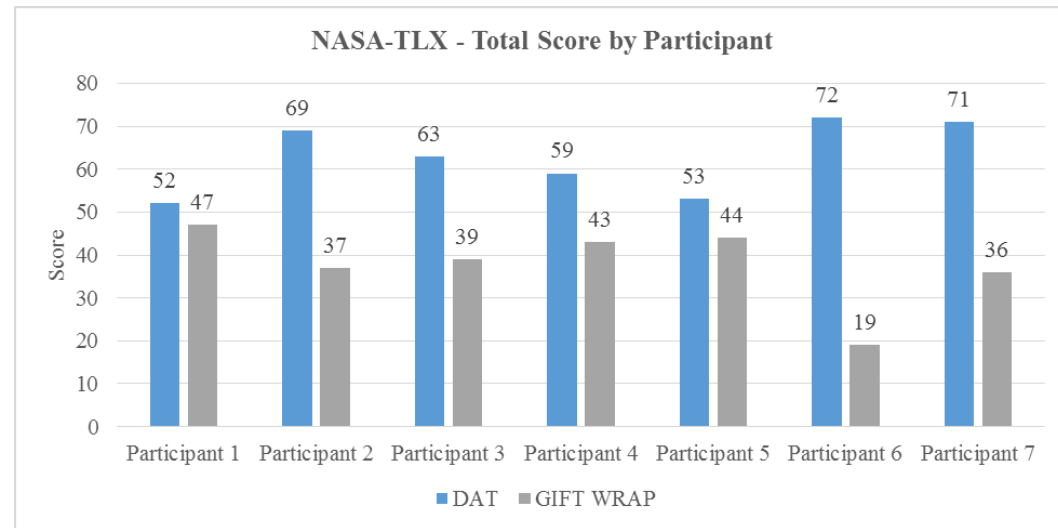
Set a tolerance (distance)

Validating the Design

- Small scale usability test – gather user feedback on perceived ease-of-use and compare system performance
- Authoring a DKF with DAT vs. 3rd Generation GIFT Wrap
- 7 participants completed a comparable set of tasks
- Subjective Measures
 - NASA-TLX – subjective workload
 - System Usability Scale (SUS) – subjective assessment of usability
- Objective Measures
 - Completion Time
 - Prompts Required
- Observations and Post-test Interview

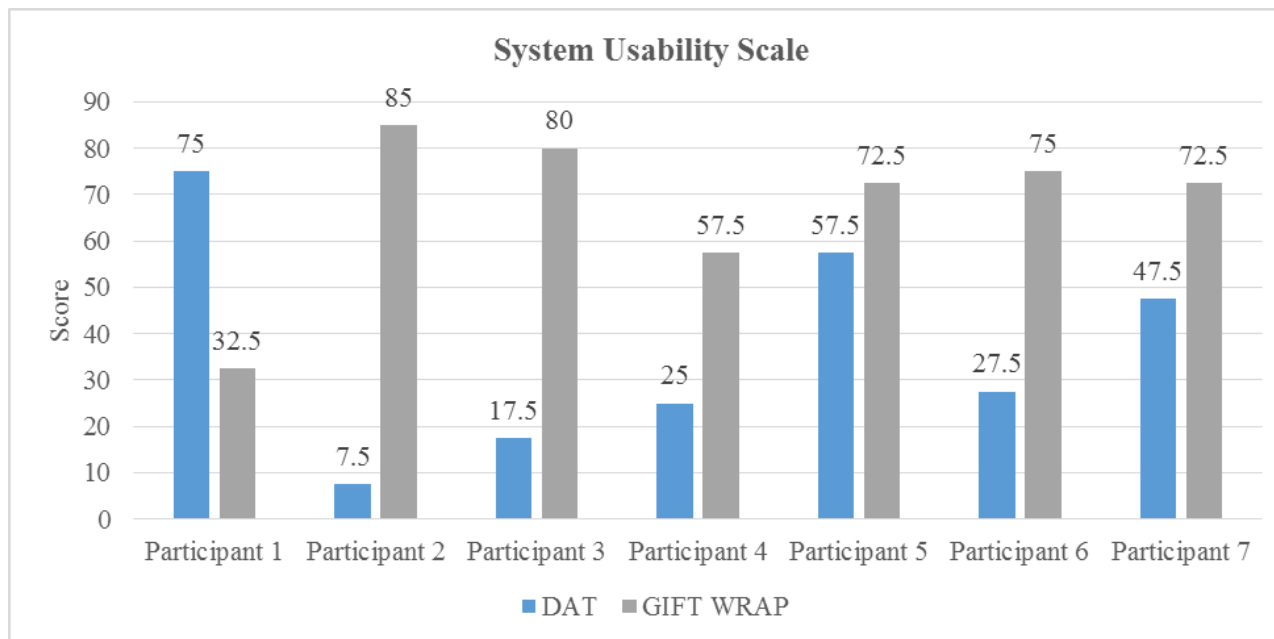
Subjective Measures – NASA-TLX

- Participants reported experiencing higher workload with the DAT ($M = 62.71$, $SD = 8.34$) than with GIFT Wrap ($M = 37.86$, $SD = 9.21$)
- Mental Demand, Performance, and Frustration appear to have contributed the most this difference



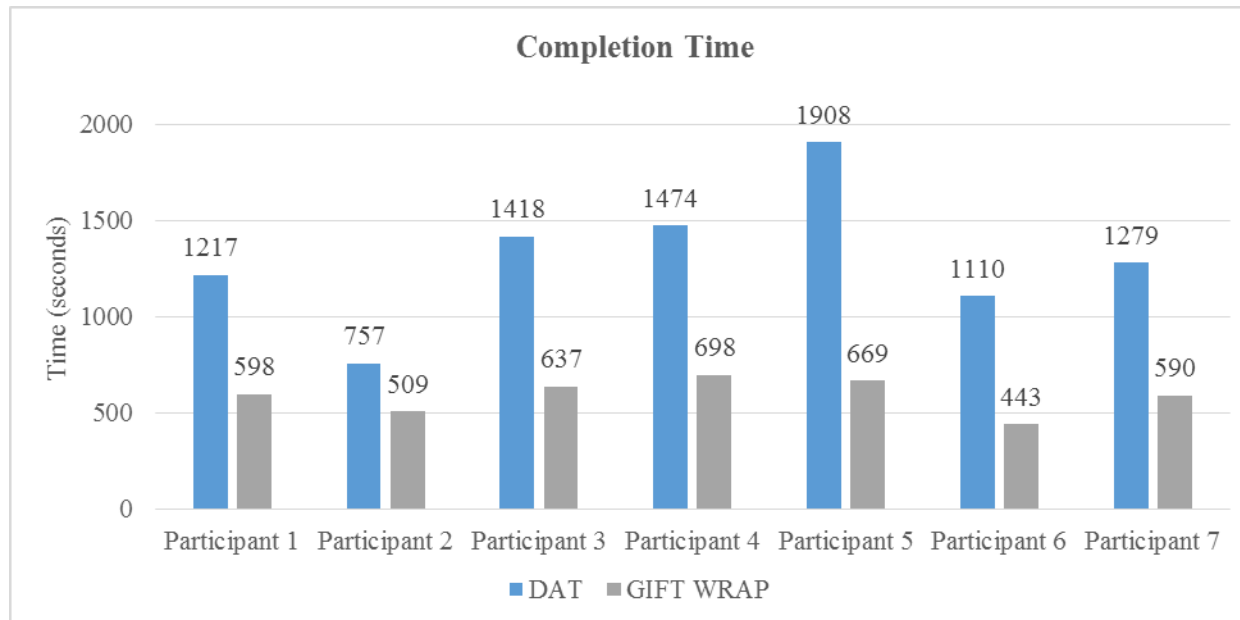
Subjective Measures – System Usability Scale (SUS)

- All but one participant reported better perceived usability for GIFT Wrap ($M = 67.86$, $SD = 17.76$) than for the DAT ($M = 36.79$, $SD = 24.01$)



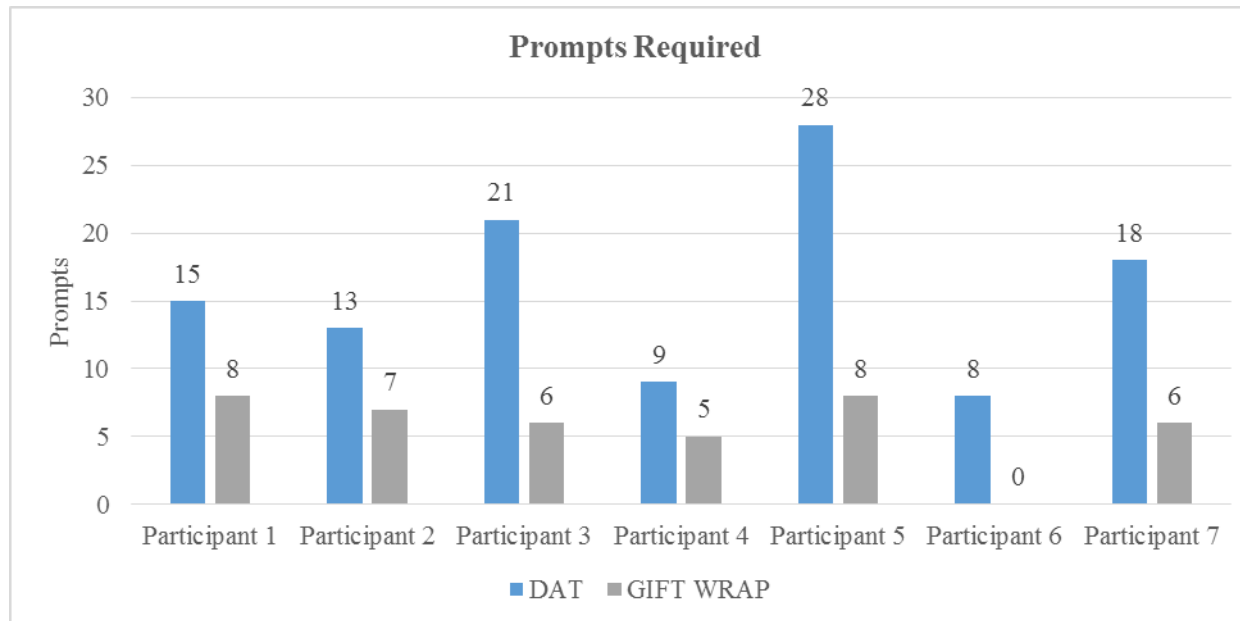
Objective Performance Measures – Completion Time

- Participants required more time to complete the test tasks with the DAT ($M = 1309.00$ (21min 49s), $SD = 353.92$) than with GIFT Wrap ($M = 592.00$ (9min 52s), $SD = 89.74$)



Objective Performance Measures – Prompts Required

- Participants required more prompting to complete the test tasks with the DAT ($M = 16.00$, $SD = 7.02$) than with GIFT Wrap ($M = 5.71$, $SD = 2.75$)



Participant Feedback & Other Observations

| | GIFT Wrap | DAT |
|---|--|---|
| Common Usability Issues | <ul style="list-style-type: none"> • Determining how to add a new concept • Remembering to complete the end trigger • Determining how to rename items (e.g., Concepts) • Recognizing horizontal panels/tabs (e.g., Strategy panel) | <ul style="list-style-type: none"> • Save and exit errors (i.e., accidental close out of DAT with the intent of saving) • Determining how to set-up and assign waypoints • Determining how to set-up and complete strategies and/or state transitions • Determining how to add sub-concepts • Confusion about end trigger at start of authoring a task, prompted with need to return to it later |
| Users Liked Best about the Tool | <ul style="list-style-type: none"> • Layout • Intuitiveness, Simplicity • Process flow (i.e., tree menu structure) • Only relevant info presented to user | <ul style="list-style-type: none"> • More features and options apparent • Descriptive (e.g., tool-tip-text, instructions) • UI “Style” (e.g., colors) |
| Users Liked Least about the Tool | <ul style="list-style-type: none"> • Fewer instructions at interface • Fewer apparent options | <ul style="list-style-type: none"> • Confusing, Not intuitive • Frustrating flow • Not user friendly, hard for soldiers to use • Lots of clutter and/or information on interface |

Conclusions & Recommendation for Future Research

- 3rd Generation of GIFT Wrap
 - Incorporated additional DAT functionality into the new UI design
 - Extended GIFT's authoring capabilities to a new TA
- Usability testing demonstrated that GIFT Wrap is more user-friendly than legacy authoring tools
 - Accessible to the average user without eliminating the important features power users need
 - However, many design features could be improved
 - Use findings to iteratively improve the design

Conclusions & Recommendation for Future Research

- GIFT Wrap is now capable of authoring landnav training across multiple TAs
 - Authoring tools and RTAs/Condition Classes easily extendable to training in live environments via integration with mobile devices
- Developing functionality necessary for GIFT to communicate with mobile devices
 - Retrieve RTA data
 - Push instructional interventions to learners via a mobile TUI
- Initial proof-of-concept will aim to layer GIFT's tutoring capabilities over existing live terrain walk exercises at USMA

Stand 1: Orientate Map (WL 78641 77481)

Task: Orientate Map and plot location using visible terrain features.

Condition: Identify features

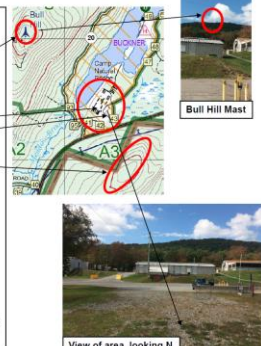
- Bull Hill Mast
- Camp Natural Bridge buildings
- Distinctive road pattern
- Ridge to south

Standard:

- Orientate Map North
- Give 8 figure grid

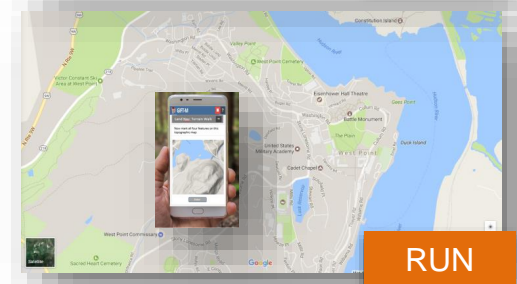
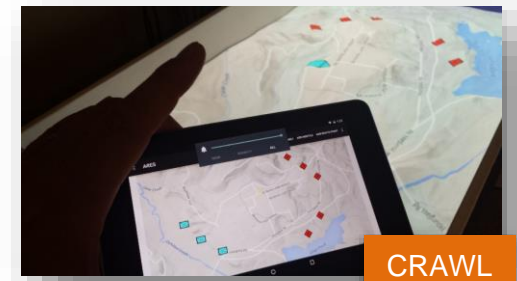
Time: 10 minutes

Remarks: Assist with orientating map where required and have CDTs confirm their location using 8 figure grid.



Conclusions & Recommendation for Future Research

- Near-term GIFT Wrap R&D efforts
 - New, user-friendly authoring capabilities
 - Terrain walk specific RTAs
 - Pace Count, Plot Route, Mark Features
 - Integration with web mapping services
 - Application of existing capabilities to this new environment
- 4th Generation GIFT Wrap
 - LandNav training via GIFT ITS
 - Scaffold the learner's phased skill development across three complimentary training environments



Backup Slides

