

WMD Incident Management Simulation and Tutor

NIEHS

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Stottler Henke
Smarter Software Solutions

Project Team

Stottler Henke - Artificial intelligence software
intelligent training simulations
intelligent tutoring
scenario authoring tools

Hank Christen - expert: disaster preparedness
EMS Incident Management System
NIMS Principles and Practice
Understanding Terrorism & Managing Consequences
Terrorism Response: Field Guide for Fire & EMS Organizations
Mass Casualty and High Impact Incidents

Nathaniel Hupert, MD – Cornell Medical School
Public Health and Hospital System Preparedness for
Bioterrorism and Epidemic Outbreaks

Stottler Henke ITS Applications

Military & Space

Tactical decision-making Helo cockpit operations
Command and control Helo piloting
Sonar data analysis Information warfare
Satellite operations Air Operations Center
Counter-terrorism data analysis
Joint staff officer inter-Service/agency teamwork
System diagnosis and recovery
Air Planning – cultural reasoning

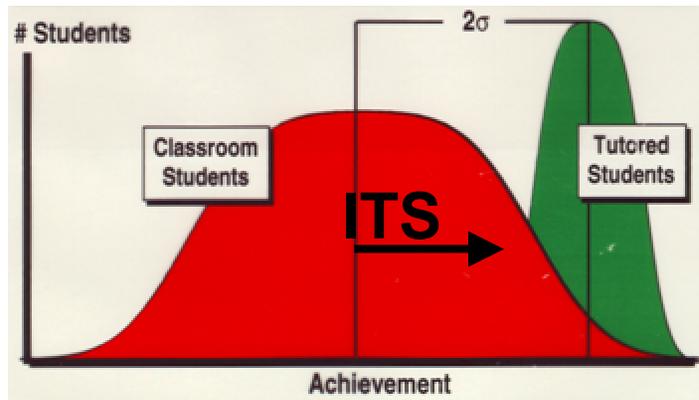
Professional

Emergency medicine
Equipment and software operations
Leadership, project management

K-12 & College

Earth science / satellite imagery (HS, college)
Reading comprehension (adult)
Math (Grades 3-6, algebra)
Nutrition (Jr. HS)

Intelligent Tutoring Systems (ITSs)



ITSs emulate the practices of an organization's best instructors to provide the benefits of one-on-one tutoring automatically and cost-effectively

- Evaluates student actions and/or utterances
- Assesses student's knowledge and skills
- Interventions = hints, feedback, questions, remediation, guided reflection -- adapted to each student
- Complements classroom instruction and/or CBT

Simulation Complements Field Exercises

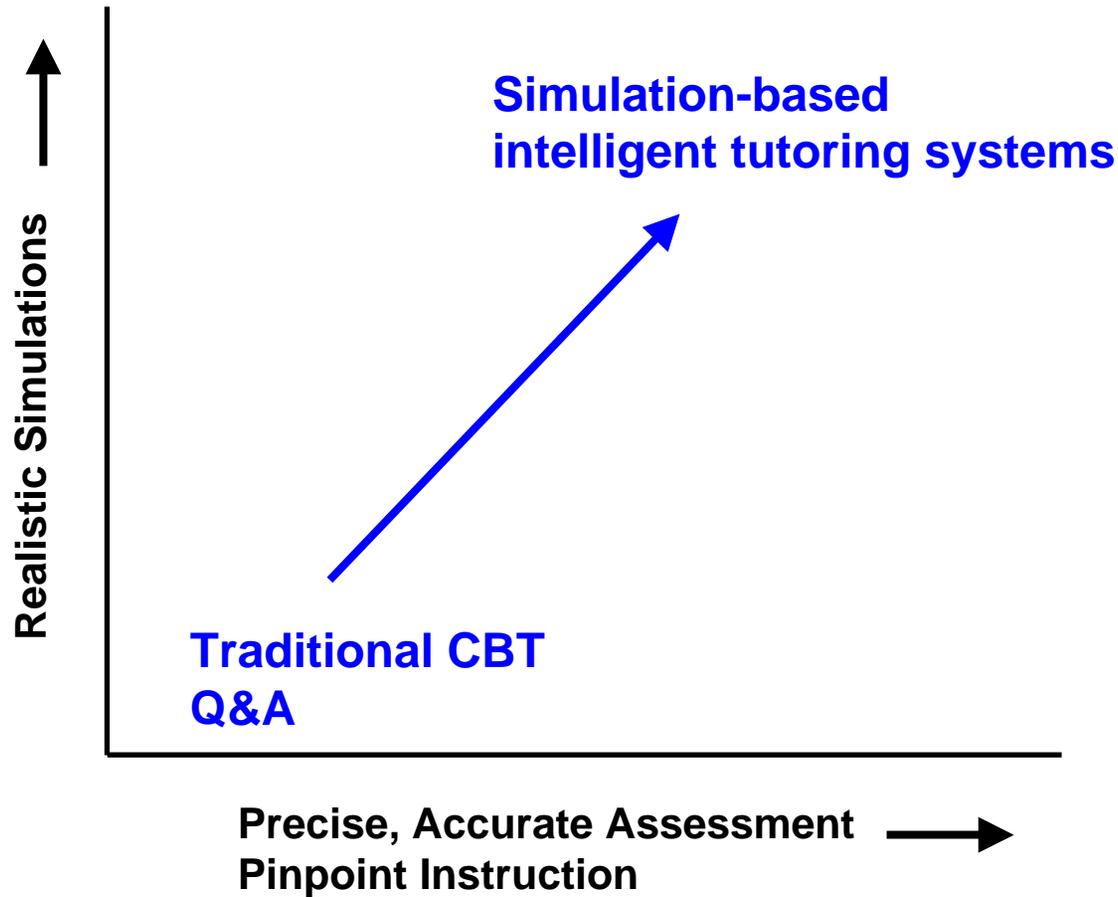
Advantages “any time, anywhere” learning
at low incremental cost per student-
experience

High learning density (learning vs. time)
(focused student learning experiences)

Higher conceptual fidelity –
less scripting of student actions
students assess situations and decide

Disadvantages Lower physical/social/visual fidelity

Sim + Tutoring = Improved Training



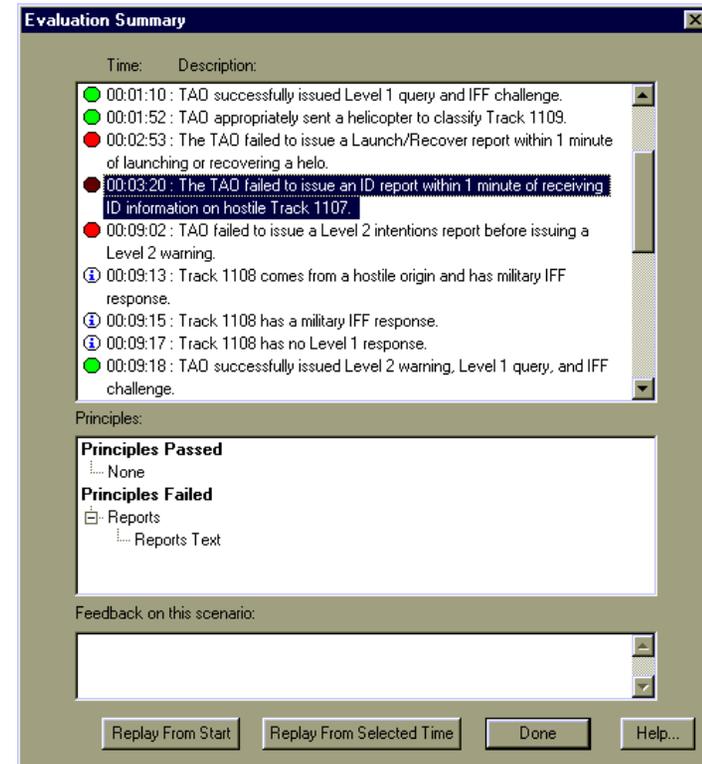
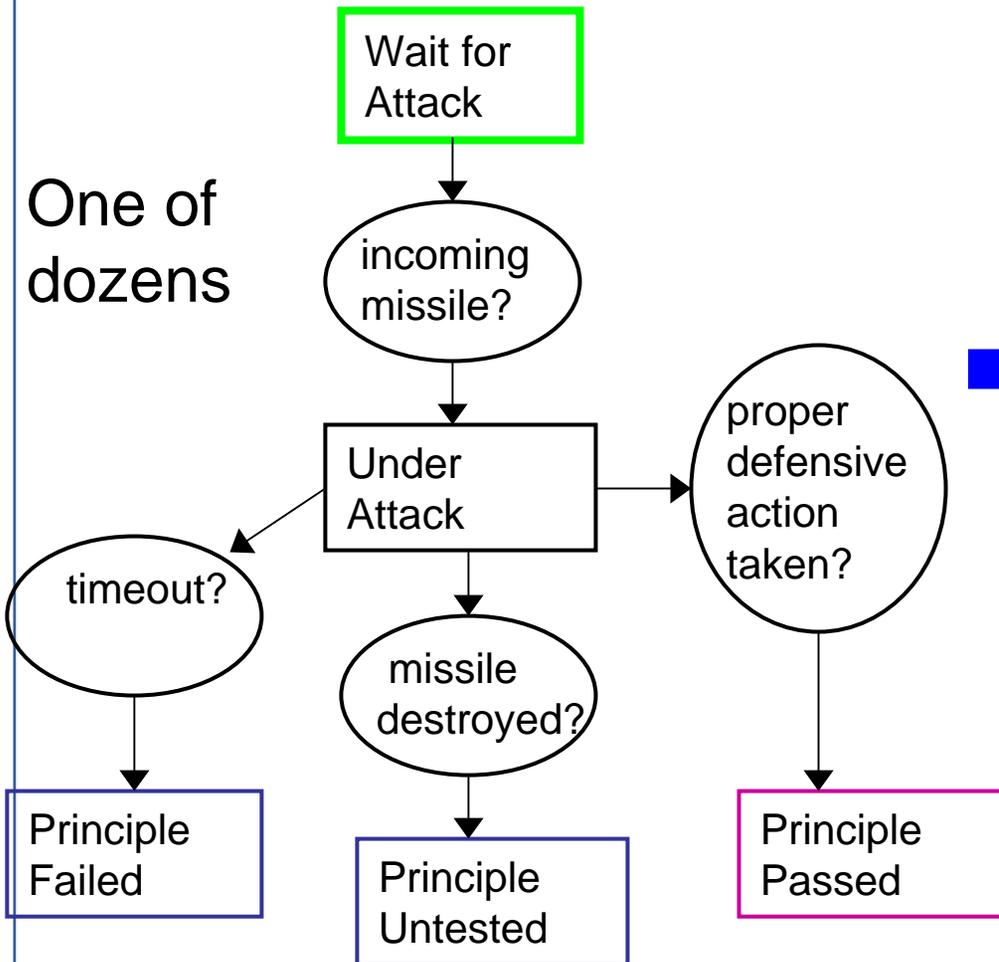
Sim-Based Tutors are Effective

- Dr. Wes Regian (Air Force Labs) reports average improvement of 1σ , vs. classroom instruction
- John Anderson of CMU reports that ITSs:
 - Required 1/3 less instruction time
 - Yields 1 standard deviation performance improvement
- Air Force avionics tutor evaluation
 - 20 hours with tutor = 4 years OJT
- US Navy reports 10x increase in tactical experience using Stottler Henke's Tactical Action Officer ITS

Navy Tactical Action Officer



TAO ITS v1 - Assessment Example



TAO ITS – Version 2

The screenshot displays the TAO ITS Version 2 interface, which is divided into several functional areas:

- Control Panel (Left):** A vertical stack of buttons and a numeric keypad. The top section contains buttons for 'OVERLAY PLOT STATE', 'CAT STATE', 'OTR ANALY STATE', 'MANUAL TRACK STATE', 'GRAPHX ENTRY STATE', 'DOCTRM STATE', 'LINK STATE', 'REPLAY STATE', 'SCREEN FEATUR STATE', and 'SINGLE CTRL'. Below these are buttons for 'STW STATE', 'ASM STATE', 'SIGN STATE', 'FK HST STATE', 'PAMNVR STATE', and 'SCREEN COPY STATE'. The bottom section includes 'FORCE BATTLE STATE', 'ARRAY CANCEL STATE', 'ENTRY/UPDATE STATE', 'ALERTS STATE', 'O/S BATTLE STATE', 'ADS OPS STATE', and 'STATE'. A numeric keypad (0-9) and function keys like 'MIC', 'PLA', 'NET', 'RT', 'CON', 'IP', 'CLR', 'FRT', 'ABO', 'MIX', 'DASH', 'POWER', and 'DASH' are also present.
- Data Display (Top Right):** A green screen showing 'ALOT TIME 18:53:29' and 'TH 80053 X1'. It lists various parameters: 'AIR PEND', 'PLT TYP -', 'TAG -', 'IFF NO: SIC TRY', 'M4: NO TRY', 'DIT', 'BRG 332 DEG', 'DRG 104 NM', 'CRS 149', 'SPD 449/0.6', 'ALT 3300 FT', 'SCN RADAR', 'STR ONE', and 'SPY 135'. Below this is a section for 'ROLE SELECTION ASSIGNMENTS ASSIGNED CNSL' with a list of roles: 'EDA', 'STAO', 'EC', 'CO', 'TAG', 'ODA', 'FAAWC', 'FASWC', 'FASUWC', 'PIC', and 'DSPLY UTILITY'.
- Map (Bottom Right):** A map showing a coastal region with a blue sea and brown land. A white circle with a crosshair is centered on the map. The map is labeled 'REF: SPY-1', 'MODE: NORMAL', 'DATE: SIDCODE', 'TIME: 18:53:29', and 'RANGE SCALE: 254 NM'. A yellow banner at the bottom of the map area contains the text 'Does track 80053 correlate to ID given?'.
- Utterance Editor (Bottom Right):** A small window titled 'Utterance Editor' with a microphone icon and a 'Submit' button.

Tactical Action Officer (TAO) ITS

Students U.S. Navy Tactical Action Officer students

Problem Improve the tactical proficiency of Tactical Action Officers (TAOs) cost-effectively.

Solution Free-play tactical simulation with intelligent friendly and enemy forces and speech-enabled teammates (v2)

Automated evaluation of student performance
Principles passed/failed reported at end of scenario

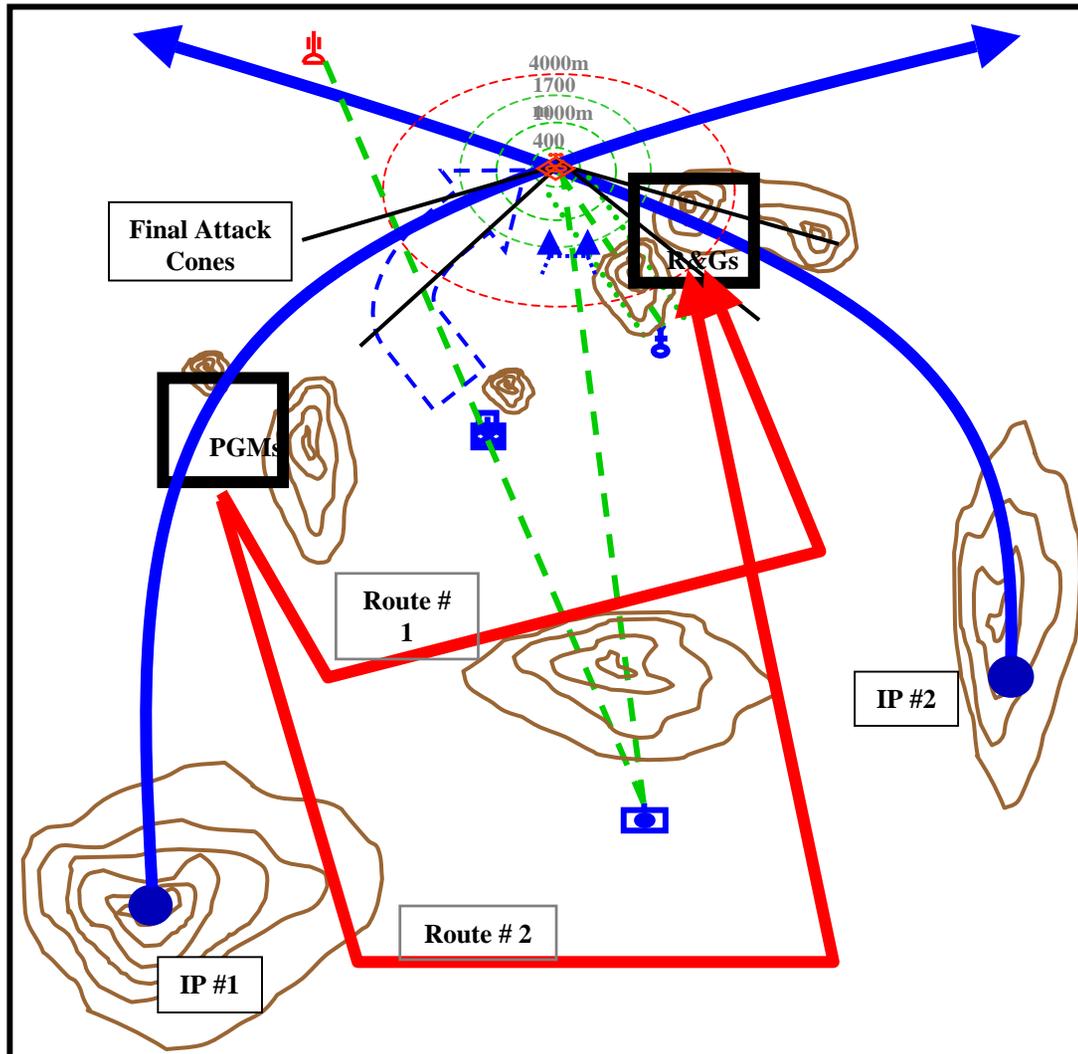
Assessment Approach Many finite state machines, running in parallel, track sequences of actions and states that show presence/absence of specific knowledge and skills.

Status Version 1 – U.S. Navy SBIR Success Story.
Version 2 in acceptance testing.

Combined Arms Team Training



Combined Arms Ops = Close Teamwork



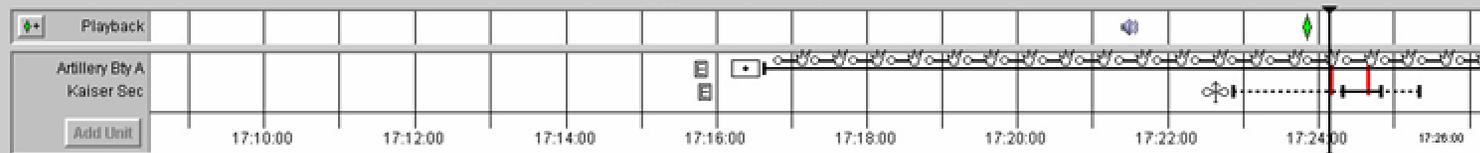
- Artillery gun target lines
- Mortar gun target lines & surface danger zone
- Helicopter routes
- Helicopter battle positions
- Aircraft routes
- Ground maneuver
- Ordnance danger areas
- Enemy threat rings
-

Playback via 2D, 3D, Timeline Displays



17:24:08

Arty1 Conflict: Kaiser Sec intersection with Arty Trajectory



Details BSG RTE 2D 2525 Description Causal Factors Comments Reset Cam Save Cam Done

After-Action Intelligent Review System

Students Fire Support Coordination teams
for Marine Corps Combined Arms Operations

Problem Help instructors assess the performance of 100+
students during team training simulations

Solution AAIRS automatically detects and reports errors and
conflicts to instructors and provides incident playback
using 2D, 3D, and timeline displays.

**Assessment
Approach** Speech recognition extracts key words, phrases
AAIRS analyzes decisions, voice communications,
and simulation events to detect and explains errors

Status Key part of system that received Florida
Governor's Award

WMD Incident Management Project Vision

Enable Situation assessment
widely deployable Tactical decision-making
easily customized
experiential Command, control,
application-level learning communication (NIMS)
of incident management
knowledge and skills
for diverse student roles
organizations and
WMD scenarios
Employ simulation and
intelligent tutoring to improve
performance via active
learning (vs. factual recall and
passive learning)

Phase 1 Scope

Develop and demo
an initial prototype
scenario to illustrate
the instructional approach
and elicit estimates of
instructional effectiveness
and market demand

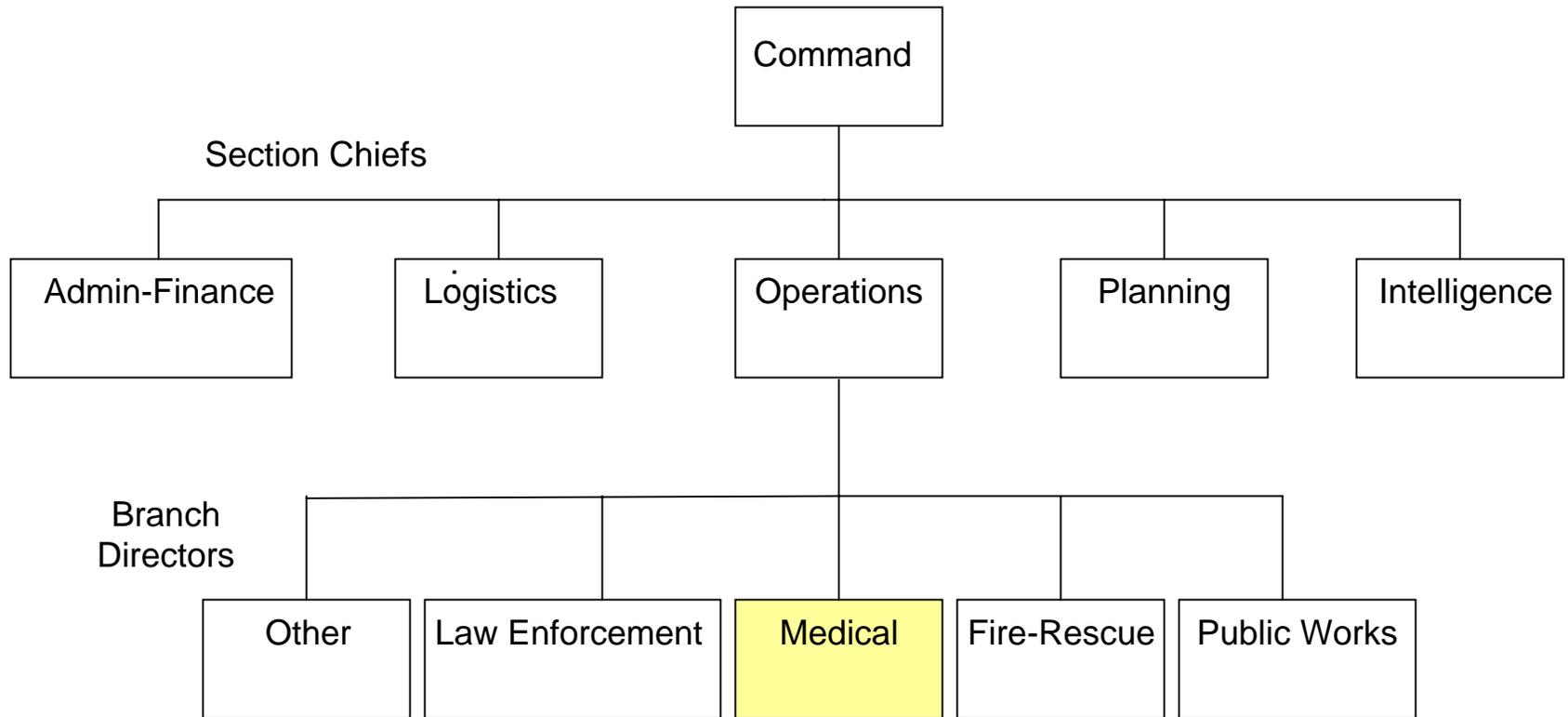
Scenario:

Chemical incident
Medical Branch Director

Simulation:

radio communications
reference documents
maps
command charts

NIMS Command Hierarchy



Student role in
prototype scenario



Phase 1 Prototype



Simulation-Based Tutoring Scenarios

Briefing Student role
Background
Recent events

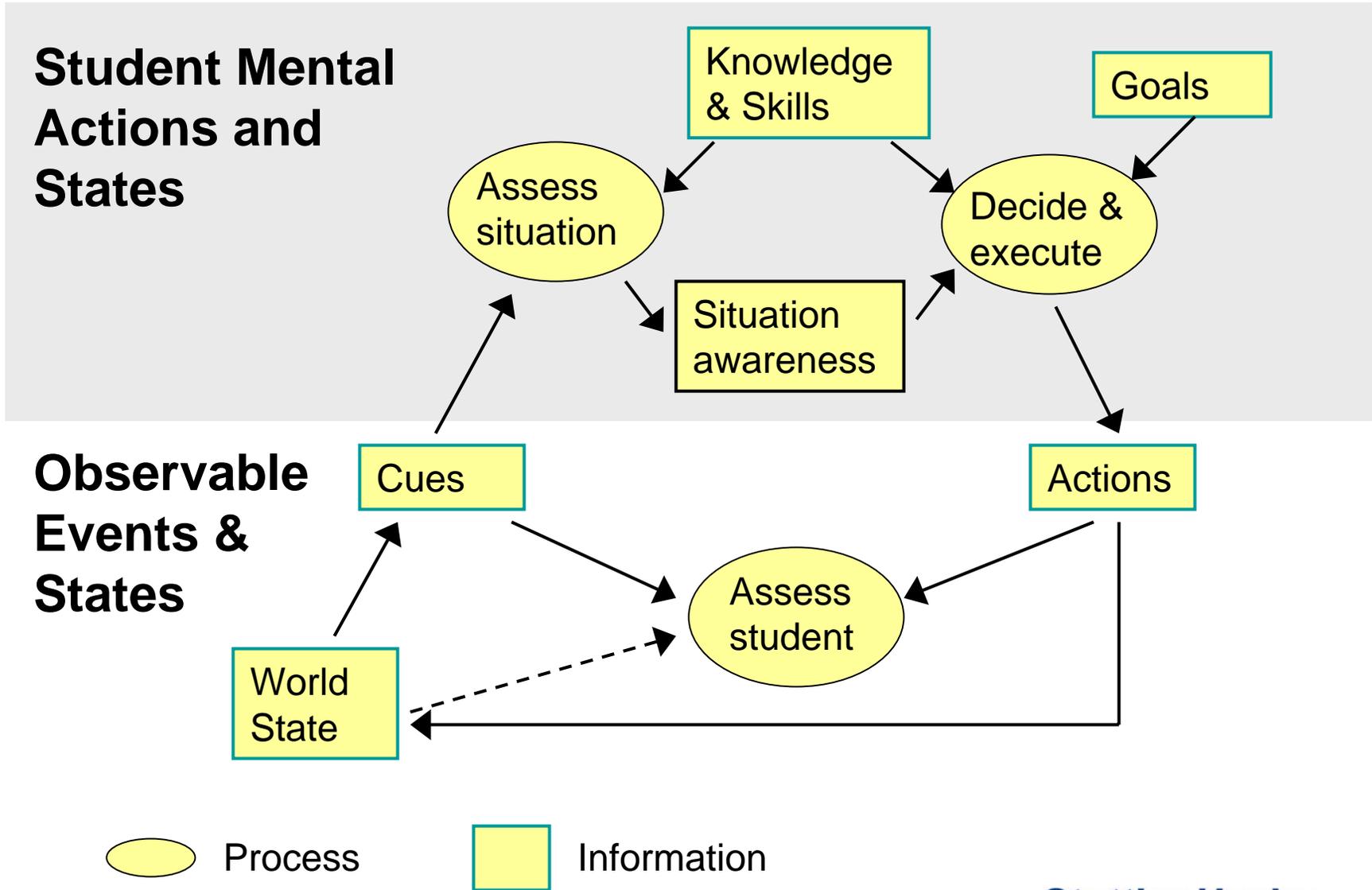
Simulation Carries storyline
Presents decision cues
Accepts and responds to actions
Provides hints

Debriefing Provides performance feedback
(intelligent tutor) Guides reflection (phase 2)

Training System Design Goals

- Effective and Efficient** Challenging, engaging situations
Automated performance feedback
Many learning objectives / hour
- Conceptual realism** Realistic types of situations, info cues, actions, sim responses
- Diverse students** Adaptive hinting
- High volume distance learning** Web/SCORM friendly
Avoid costly 3rd party software
- Rapid scenario development and customization** Scenario authoring tools w/ domain-specific extensions and easy-to-create media

Performance Model Guides Scenario Design



Planned Phase 2 Scope

Increase usability
and sophistication
of scenarios

Presentation of information cues
Entry of student actions and notes
Simulation models and responses
Student performance assessment
Instructional feedback and dialogs

Expand breadth
of scenarios

Scale and type of incidents
Student role and organizations (first responders, hospitals, communities)