Dynamic Learning Through the use of Simulators
Modeling and Simulation (M&S)

• Designated as a “National Critical Technology” in 2007
  • ~ $7.5 Billion spent each year by the DoD
  • Changing the face of healthcare
  • Improving manufacturing design efficiency
  • Poised to have a profound impact on education & training
• Serious Gaming
• Virtual moving from just simulated environments to social interactions
A New Model of Learning

• Learning – Engagement that changes perception, belief or behavior
Learning is Social
Learning is Contextual

• Learning occurs only when students process new information or knowledge in such a way that it makes sense to them in their own frames of reference
Dynamic Learning

• Learning is engaged and reflexive participation in a life-discovery process that builds new knowledge and enhances the development of skills and competence appropriate to the personal, social, and technical contexts of importance to the learner.
Dynamic Learning Model

- Dimensions
  - Historic Awareness
  - Open Environment and Belief System
- Process
  - Reading
  - Writing
  - Collaboration
- Active Engaged Learning
What is a Simulator?

• **Simulator**
  - Hardware or apparatus that generates the simulation

• **Simulation**
  - The representation of conditions approximating actual or operational conditions

• **Scenario**
  - A specific simulation with a specific objective.
Why Use a Simulator?

• Skill Transfer
• Dynamic
• Engaging
• Contextual
• Relevance
• Experimentation
• Verification
• Validation
• Safety
• Evaluation
• Team Building and Team Dynamics
Types of Simulators

• Live = Humans and/or equipment and activity in a setting they would normally operate in for real

• Virtual = Humans and/or equipment in a computer-controlled setting

• Constructive = Typically does not involve humans or real equipment
So what’s needed?

- Planning and Design Criteria
  - Students
  - Task
    - Complexity
    - Hazards
- Fidelity
- Functional Design Criteria
- Instructors
- Scenarios
- Integration
Fidelity......the degree to which a model or simulation reproduces the state or behavior of a real world object
Functional Design Criteria

• Inherently safe
  • Hazardous Energy Control
  • Ergonomics

• Design Team
  • Multiple disciplined

• Flexible
Instructors

• Senior Instructors with a wide breadth of knowledge/experience
  • Operations/Maintenance Background (real-life experience with the systems, processes, or equipment being simulated)
  • Deep understanding of the simulator capabilities
  • Passionate
  • Strong Communication and Facilitation Skills
Scenarios

• Individual components, equipment, and systems
• Normal startup, operation, and shutdown
• Response to plant/system transient, abnormal, and emergencies
• Plant and industry operating experience
• Re-enforcement of theory and fundamentals
• Teamwork, communications, diagnostics
Integration

• Learning Modalities
• Functional Areas
• Simulations
Typical Content for Simulator Evolution Procedure/Lesson Plan

- Purpose & Scope
- Type of training
  - Demonstration
  - Training
  - Evaluation
- Instructor guidelines
- Use of procedures
Typical Content for Simulator Procedure (cont.)

• Conducting and evaluating training
  • Instructor requirements
  • Briefings
  • Conduct of simulation
  • Post-exercise critiques
  • Individual or team evaluation

• Crew composition
• Required evolutions
• Use of evaluation guides
• Use of simulator features
Conclusions

• Simulators offer a unique opportunity for learning
  • Allow practice in a safe environment
  • Reduce costs
  • Provides a platform that is engaging, dynamic, contextual, and social

• Computer Hardware/Software will now support almost unlimited possibilities in human-in-the-loop virtual/life simulations
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