

SERC RESEARCH REVIEW 2023 | NOVEMBER 15, 2023

# Federal Law Enforcement Training Center Training Systems Curriculum Study

W15QKN-19-D-0040

DHS S&T



**SYSTEMS**  
ENGINEERING  
RESEARCH CENTER

# Agenda

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- Project Overview
- Methodology
- Recommendations
- Way Forward / Follow-on Work
- Conclusion



# Project Overview

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The FLETC Training Systems Curriculum Study will identify course delivery methods and course evaluation methods to serve as basis for future systematic development of a curriculum that integrates classroom, e-learning and range environments. The study will consist of two distinct but related tasks:

**Task 1:** ODU / VMASC conducted a study that will analyze the educational capabilities of FLETC and determine where the introduction of or improvement to the modeling and simulation capabilities of FLETC could enable it to deliver more effective and efficient education.

**Task 2:** ODU / VMASC analyzed utilization of modeling and simulation concepts developed during the first task and plan for a proof-of-concept demonstration during course delivery in order to define operational requirements and refine the system concept as well as technical requirements.

Period of Performance: 17-Sep-2021 thru 15-Dec-2023

# Methodology

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Old Dominion University (ODU) used a set of validated frameworks to evaluate existing FLETC courses with and without Modeling & Simulation (M&S) technology.

## **Task 1:**

- Applied the Anderson Model of Learning Evaluation, a three-stage learning evaluation cycle that is designed to be applied at an organizational level.
- Identified embedded content processes and optimization methods to review current and future implications of course enhancements.
- Used the International Society for Performance Improvement's (ISPI) Performance Improvement/HPT Model to work through the process of adding M&S training into the curriculum.

## **Task 2:**

- Applied Task 1 results to identify a methodology to create a model of the enhanced curriculum.
- Leveraged a Systems Engineering approach and utilized an architecture framework to capture the curriculum from both a behavioral and structure perspective.
- Developed presentation showing the curriculum as a series of learning activities decomposed into skill sets; changes to the delivery of the course curriculum may modify these skills sets.
- Provided a proof-of-concept model of the M&S utilization; the scenario representing the sequence of the course curriculum provides the baseline model.

Period of Performance: 17-Sep-2021 thru 15-Dec-2023

# Task 1: Determine where the introduction of or improvement to M&S capabilities could enable FLETC to deliver more effective & efficient education.

## Finding and Insights

| Level | During focus group sessions, our research uncovered the following findings and insights.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|-------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Crawl | <ul style="list-style-type: none"><li>Minimize venue changes, as it limits student centered learning time, and instructors must reacquaint themselves to their surroundings.</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Walk  | <ul style="list-style-type: none"><li>Centralize ITS so that instructors do not have to troubleshoot technological issues.</li><li>Scheduling – increase class time to increase student centered learning. Align location and class schedule to minimize travel to and from venue.</li><li>Create a dedicated instructional design team/department. Off load course design tasks from instructors.</li><li>Ramp up Instructor training to focus on facilitation skills and techniques.</li></ul>                                                                                                                                                                                                                         |
| Run   | <p>Adopt a capability model that includes processes in the following domains:</p> <ul style="list-style-type: none"><li>Learning – Processes that directly impact on pedagogical aspects of learning and eFLETC of the future.</li><li>Development – Processes surrounding the creation, maintenance, and sustainability of learning resources and eFLETC of the future.</li><li>Support – Processes surrounding the support and operational management of learning and eFLETC of the future.</li><li>Evaluation – Processes surrounding the evaluation and quality control of learning through its entire lifecycle.</li><li>Organization – Processes associated with organizational planning and management.</li></ul> |

## Task 1: Determine where the introduction of or improvement to M&S capabilities could enable FLETC to deliver more effective & efficient education.

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Research task number one revealed 38 gaps and makes 64 recommendations organized by crawl-walk-run as implementation suggestions.

| Course                                 | Crawl | Walk | Run | Total |
|----------------------------------------|-------|------|-----|-------|
| LP 5046 Use of Force                   | 3     | 3    | 2   | 8     |
| LP 6000 Law Enforcement Handgun        | 4     | 2    | 2   | 8     |
| LP 8016 Tactical Medical               | 4     | 3    | 4   | 11    |
| LP 5111 Active Threat Response Tactics | 3     | 5    | 4   | 13    |
| LP 1211 Fourth Amendment               | 5     | 4    | 3   | 13    |
| Future of FLETC                        | 5     | 2    | 4   | 11    |
| Total                                  | 24    | 19   | 19  | 64    |

# Recommendations by Course

## LP 5046 Use of Force

### **Crawl**

- Design/development of a FLETC Simulation-Based Course Development Framework
- Revisions to Course EPOs
- Design/development of a FLETC Simulation-Based Tool/Resource Evaluation Rubric for Courses

### **Walk:**

- Analysis of VirTra (and/or other currently used) simulated scenarios, content, deployment of material to evaluate strengths and/or training performance gaps evident
- Design of new Use of Force simulated scenarios
- Piloting, testing, and iterating Use of Force simulated scenarios

### **Run:**

- Launch new Use of Force simulated scenarios
- Additional future enhancements to scenarios

## LP 6000 Law Enforcement Handgun

### **Crawl:**

- Design/development of a FLETC Simulation-Based Course Development Framework
- Revisions to Course EPOs to include the degree of proficiency and constraints/conditions to measure performance effectively
- Design/development of a FLETC Simulation-Based Tool/Resource Evaluation Rubric for Courses
- Design/development of FLETC Simulation Data Architecture System Framework

### **Walk:**

- Test/Pilot FLETC Simulation Data Architecture System Framework in Handgun course
- Using laser guns and SIRT Laser Pistols on the virtual range, additional data input within the new Sim Data System

### **Run:**

- Additional research of FLETC Simulation Data Architecture System
- Extending range time to 2 hours for more student practice

# Recommendations by Course

## LP 8016 Tactical Medical

### Crawl:

- Revisions to Course EPOs to include the degree of proficiency, measures of proficiency, and constraints/conditions to measure performance effectively
- Design/development of a FLETC Course Simulation-Based Readiness Framework
- M&S Technology Suggestion: Virtual Reality or Extended Reality
  - o Internal FLETC research on equipment, operational, feasibility, development, content, and deployment analysis
- Add diverse role-players and enhanced decision making during in-person scenarios

### Walk:

- Design/testing of VR/XR Tactical Medical scenarios
- Conceptualize various utilizations of in-scenario VR/XR user actions as formative data, metrics for learner performance tracking
- Additional enhancements to course

### Run:

- Enhancement of VR/XR scenarios as team/collaborative environment
- Testing/piloting learner performance data during VR/XR scenarios; adaptive scenario gameplay
- Development of sustainment plans for M&S Technology equipment, operations, and advanced training of instructors
- Additional enhancements to course

## LP 5111 Active Threat Response Tactics

### Crawl:

- Revisions to course EPOs 1-4 to include the degree of proficiency and constraints/conditions to measure performance effectively
- Design/development of a FLETC Course Simulation-Based Readiness Framework
- M&S Technology Integration Suggestion: Web-Based Active Threat Tactic Interactive Scenarios (similar to serious game modules)

### Walk:

- Design initial web-based Active Threat simulation module
- Test/iterations
- Pilot adjusting training schedule to incorporate student/trainee engagement pre/post microdrills and scenario-based training
- Development of sustainment and/or improvement plans for Active Threat module technology equipment, content, operations, and training of instructors
- Design/development/research of FLETC Serious Simulation Evaluation Framework

### Run:

- Development and enhanced improvements of additional Active Threat web-based, interactive scenario modules
- Design/development of FLETC Knowledge Management System for serious simulations for training
- Design/development/research of Simulation Game Reusability Point of Reference (SGREF)
- Development of continued sustainment plans for Active Threat module technology equipment, operations, and advanced training of instructors

# Recommendations by Course

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## LP 1211 Fourth Amendment

### **Crawl:**

- Update scenarios to reflect reality based, authentic interactions
- More roleplay scenario training exercises
- Development of pre and post tests
- Revisions to Course EPOs to include the degree of proficiency and constraints/conditions to measure performance effectively
- Minimize lecture time

### **Walk:**

- Design/development of a FLETC Simulation-Based Tool/Resource Evaluation Rubric for Courses
- Design of new Fourth Amendment simulated scenarios
- Piloting, testing, and iterating Fourth Amendment simulated scenarios
- VR scenarios to replace old videos

### **Run:**

- Design/development of course content to include interactive simulation technology
- Break out course content and embed the content into LP 5046 and LP 5111
- Use LP 1211 as a capstone with the post test

# Recommendations by Course

## Future of FLETC

### **Crawl:**

- Update scenarios to reflect reality based, authentic interactions
- More roleplay scenario training exercises
- Development of pre and post tests
- Revisions to Course EPOs to include the degree of proficiency and constraints/conditions to measure performance effectively
- Engage with the IT department to take on the responsibility for VR and simulation technologies

### **Walk:**

- Conceptual design of a Curriculum Modeling and Learner Simulation Tool for FLETC Curriculum (Re)Design
- Implement a process improvement strategy to evaluate and benchmark processes to identify strengths and opportunities for performance improvement
- Increase course learning blocks to allow for more practical application of skills
- Develop a robust instructor training program for all instructors and evaluation rubric

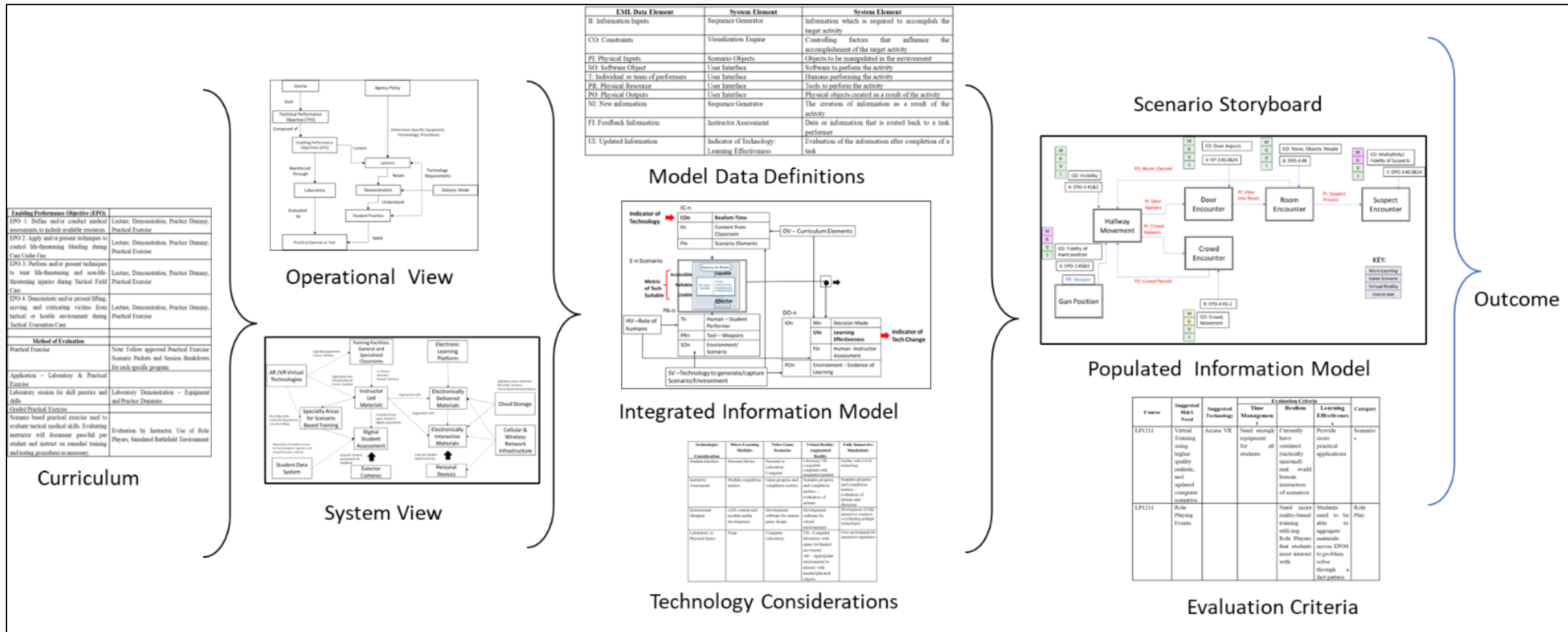
### **Run:**

- Development/Launch of a Curriculum Modeling and Learner Simulation Tool for FLETC Curriculum (Re)Design
- Develop and maintain a performance improvement process capability model to sustainably develop and support eFLETC of the future.
- The key to managing lifelong learning within the TLA is afforded through interoperable technical standards, linked vocabularies, and a federated catalog that provides pointers to authoritative sources of learner data.
- The TLA data strategy is built around commercial standards that organize the learning-related data required to support lifelong learning and enable defense-wide interoperability across DoD organizations, products, and data. The following ADL Initiative projects have spearheaded the development of distributed learning specifications and standards, and usage of the data according to these specifications.

# Task 2: FLETC Methodology Overview

Recommend adopting the integrated model and methodology to investigate the addition of different technologies into a course curriculum, set of requirements, and high-level use cases that describe e-FLETC of the future.

Use Cases Developed: 15; average 20 requirements per scenario



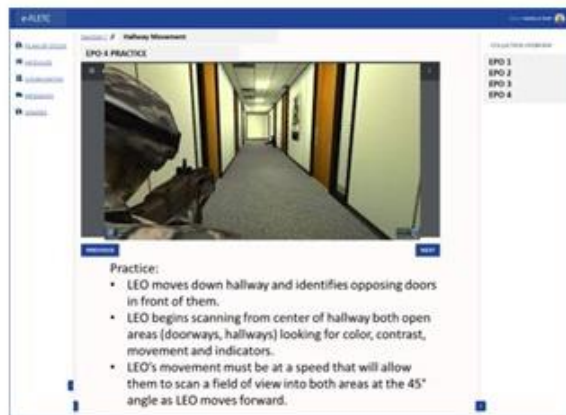
# Task 2: FLETC Modeling and Simulation Utilization Outcomes

## Developed from Source Materials and Feedback

### Use Cases

| ROLES               | Instructor                                       | Student                                          | Role Players<br>Technician                               |         |
|---------------------|--------------------------------------------------|--------------------------------------------------|----------------------------------------------------------|---------|
| TASKS               |                                                  |                                                  |                                                          | COURSE  |
| Perform Class       |                                                  | Scenario 3-A                                     |                                                          | LP 8016 |
| Review Lectures     |                                                  |                                                  |                                                          |         |
| Practice Techniques |                                                  |                                                  |                                                          |         |
| Complete Assessment |                                                  |                                                  |                                                          |         |
| Course Assessments  |                                                  |                                                  |                                                          | LP 8016 |
| Practical Exercise  | Scenario 3-B                                     |                                                  | Scenario 3-C                                             | LP 5111 |
| TECHNOLOGY          |                                                  |                                                  |                                                          |         |
| As Is               | Observations                                     | Instructor Lecture, Demonstration and Evaluation | Written Instructions with limited background information |         |
| To Be               | Automated analytics from Simulation Technologies | Mannequin, Augmented Reality                     | Micro-learning modules with background and guidance      |         |

### LMS Wire Frames



## Developed Use Case and Derived Requirements

### Use Case Writeup and Requirements Assessment

A. LP 5046 – Use of Force: Program Lead Customizing Curriculum for Different Options  
Program Lead X is responsible for customizing the LP 5046 Use of Force course for different programs. The course has 16 options available – each option has a different combination of EPOs resulting in a different combination of lectures, labs, and practical exercises which in turn induces a different number of required course hours – from a minimum of 2 to a maximum of 40. The program lead logs into the e-FLETC portal and is shown an administrative home screen. Here he chooses LP 5046 and clicks on the “Customize Course” option. The different configurations are preprogrammed into the learning portal – he chooses the correct option for the current program. The learning path, i.e., the combination of EPOs, with their associated modules is shown to the administrator. He verifies that this is correct and sends a message to the instructor for the program notifying him that the new course variant is ready for his review. The instructor is given the opportunity to review the default learning program and can make updates as necessary for the particular program.

### System Requirements

#### SYSTEM INSIGHTS

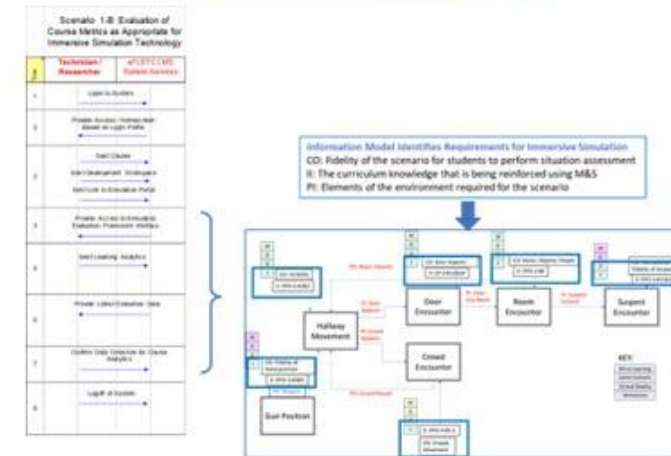
- Seamless integration of Virtual Reality with classroom and practical exercise environments.

#### SYSTEM REQUIREMENTS

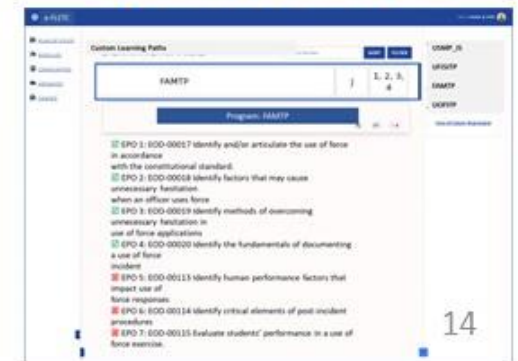
- Functional Requirements
  - M&S Technology solution
    - Connection to course materials for intended class
    - Links to visual representations of course artifacts (i.e., medical devices) and their textual descriptions, instructions, etc.
    - Connection to learning path sequences for applying medical techniques
    - Provides user controls for accessing information
      - i.e., how to interact with an Augmented Reality headset
    - Ability to function in self-learning and directed learning modes
    - Cannot distract from the learning environment
  - Dashboard for assessing courses' course materials and learning objectives
    - Located on e-FLETC learning management system
    - Allows access to:
      - Course content
      - Learning objectives
      - Learning paths for medical treatment sequences (i.e., how to apply a tourniquet)
    - Provides the ability to:
      - Upload new data to the system
      - Link developed technology materials to the related courses

## Resulting System Artifacts and Models

### Information Model Use



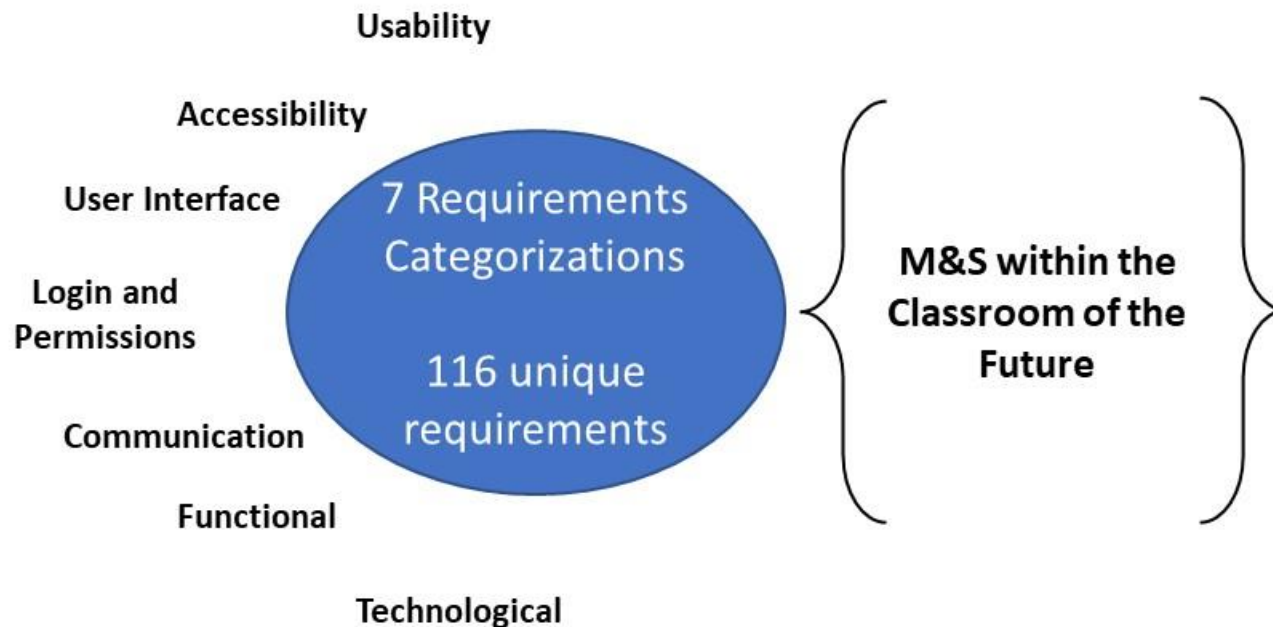
### System View Model



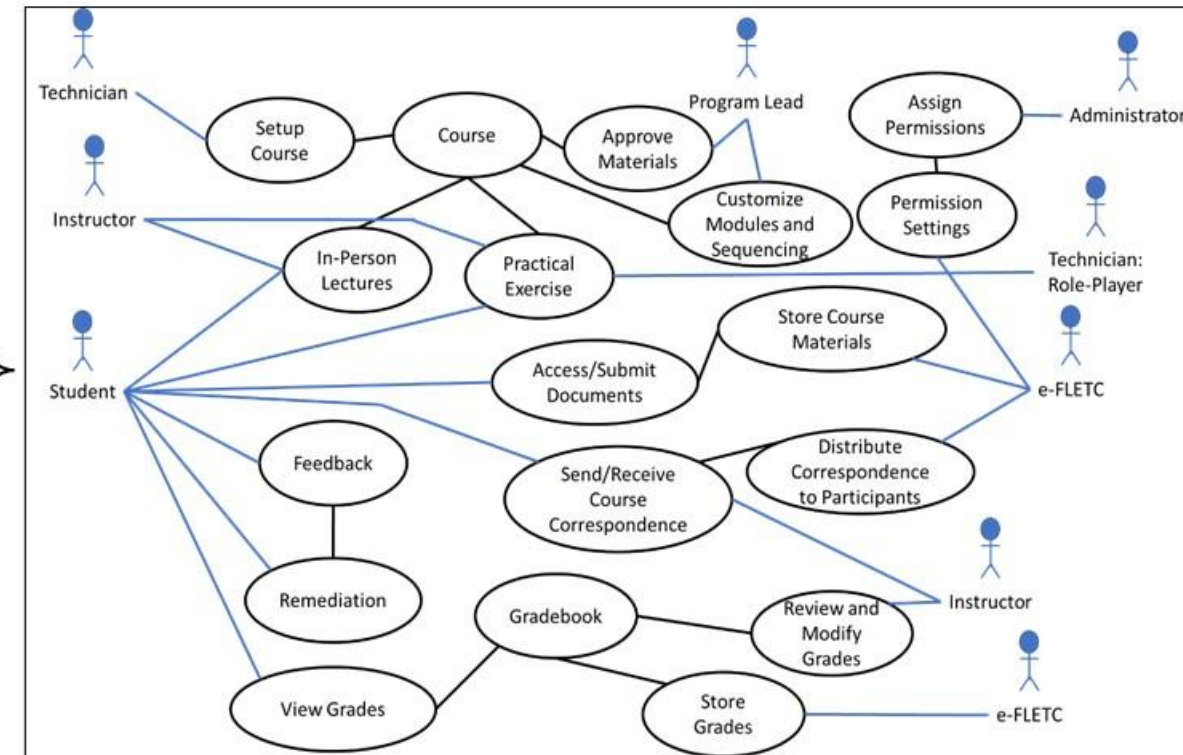
# Task 2: FLETC Modeling and Simulation Utilization Outcomes

Derived High Level Use Case Diagram and Requirements model for e-FLETC through consolidation of the outcomes from the 15 use cases.

Consolidated Requirements Model for e-FLETC



Use Case Diagram of e-FLETC Interactions



*Why this is important to FLETC leadership?*

# Way Forward / Follow-on Proposed Research (1/4)

## Task 1 - Application of Evaluation Model: Descriptive Modeling of Selected Course

Motivation: Apply the methodology we developed in Task 2.

### Phase 1

#### Select Appropriate Course & Detailed Information

**Course Selection** – Identify course based on discussion with FLETC and Course Instructors.

**Detailed Information** – Learning materials should be available at a level of granularity for populating the information model.

- Selected course should have features that make it appropriate to explore a variety of M&S techniques.

### Phase 2

#### Application of Methodology

**Model Utilization** – Information models for course learning modules that exercise different M&S options.

**M&S Evaluation** – Determine the “fit” of the different M&S options with the course materials and the instructor evaluation criteria.

- M&S techniques will be initially selected based on the criteria identified in the curriculum study.

### Phase 3

#### Generate System Requirements

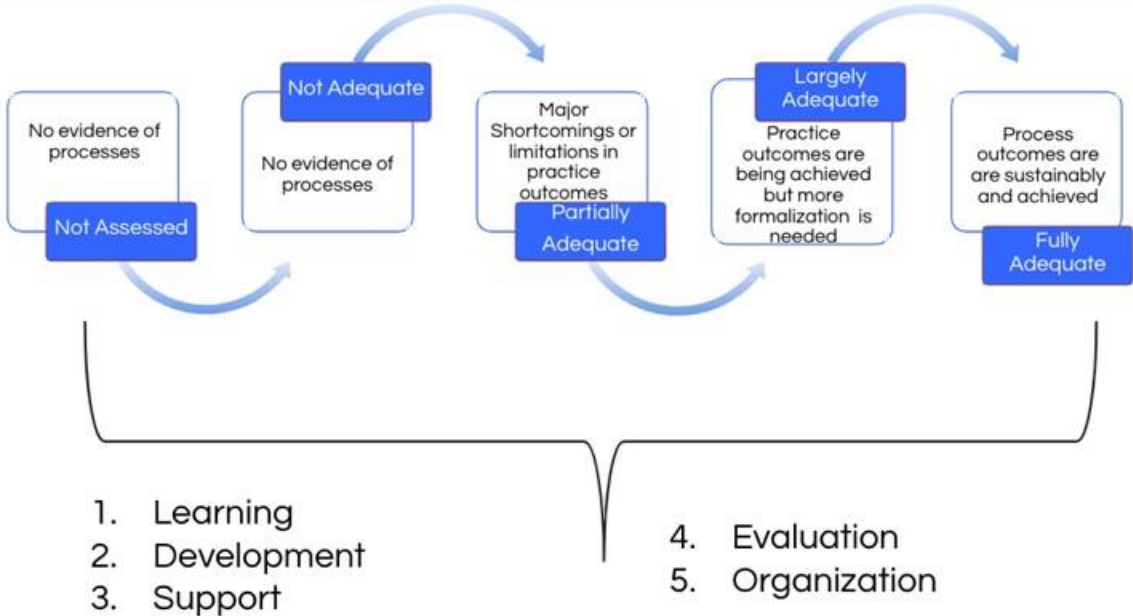
**System Design** – Create the new architecture views that represent the modified learning system.

**Requirements** – Generate the detailed list of specifications that forms a description of the new system.

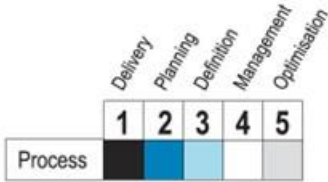
- Requirements indicate the technologies and lesson modifications necessary to implement the selected M&S.

# Way Forward / Follow-on Proposed Research (2/4)

## Task 2: Develop Curriculum Capability Maturity Model



| Process Areas | Description                                                                                          |
|---------------|------------------------------------------------------------------------------------------------------|
| Learning      | Processes that directly impact on pedagogical aspects of e-learning.                                 |
| Development   | Processes surrounding the creation and maintenance of e-learning resources.                          |
| Support       | Processes surrounding the oversight and management of e-learning.                                    |
| Evaluation    | Processes surrounding the evaluation and quality control of e-learning through its entire lifecycle. |
| Organization  | Processes associated with institutional planning and management.                                     |



# Way Forward / Follow-on Proposed Research (3/4)

## Motivation: Data-Driven, Actionable, Implementable

### Phase 1

#### External Training Research Meta-Analysis

**Quantitative Study-** This analysis provides holistic perspectives on training environments as benchmarks

- Global Best Practices
- Innovation & Emergent Technology Insights
- Risk Reduction
- Broad Perspectives

### Phase 2

#### FLETC- Internal Meta-Analysis

**Quantitative Study-** This analysis provides an overarching and historical view of all research conducted for FLETC; How training processes, techniques, and tools have worked within the organization over time.

- Synthesis and aggregation of broad research conducted across internal FLETC over time

### Phase 3

#### Synthesizing as Convergence Research

**Mixed Methods Study-** Incorporates the broad views/perspectives of all stakeholders (internal and external); Comparative Analysis and Feedback Loop for Training Refinement

- Enhanced Generalizability
- Identifying Patterns and Subgroup Analyses
- Informing Aligned, Future Research & Development
- Insight into Training Methodological Issues and Successes

## Roadmap & Implementable Framework

# Way Forward / Follow-on Proposed Research (4/4)

## Task 4: Research Study on Applications of Artificial Intelligence in FLETC Curriculum

**Motivation:** Over the course of the project, AI emerged with applications in virtually all domains. We use it now, in almost every project since early 2023.

- 1. Simulated Training Environments:** AI-driven simulations can recreate real-life scenarios helping officers practice decision-making, de-escalation techniques, and tactical responses in a controlled environment.
- 2. Predictive Policing:** AI algorithms analyze historical crime data to predict where crimes are likely to occur.
- 3. Virtual Reality (VR) and Augmented Reality (AR):** VR and AR technologies are used for immersive training experiences. Officers can practice crime scene investigation, evidence collection, and even high-stress situations like active shooter scenarios in a safe and controlled virtual environment.
- 4. Facial Recognition:** While controversial, facial recognition technology can be used for training purposes to teach officers about its capabilities, limitations, and potential biases. It can also be used for suspect identification in ongoing investigations.
- 5. Data Analysis and Crime Pattern Recognition:** AI can analyze vast amounts of data to identify crime patterns, helping law enforcement agencies develop strategies to combat specific types of crime more effectively.
- 6. Language Translation:** AI-powered language translation tools can assist officers and investigators when dealing with individuals who do not speak the local language, making communication more effective.
- 7. Behavioral Analysis:** AI can analyze video footage and detect suspicious or unusual behavior patterns, potentially assisting in identifying criminal activities or threats in crowded areas.
- 8. Ethics and Bias Training:** AI can be used to develop training modules that teach law enforcement personnel about ethical considerations and biases in policing, promoting fair and unbiased law enforcement practices.

# Thank you

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