

Opportunities for Modernizing Military Medical Training, Education, and Lifelong Learning

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- Background / Statement of the Problem
- Current Status
- Gap Analysis
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- Opportunities – 15 Year Horizon
- Summary

Background / Statement of the Problem

- Historically, there has been a large gap between the science and practice of learning
- Recently, all of the services have called for a fundamental re-examination of their training and personnel development functions
 - Army Learning Concept for 2015 (2011)
 - Sailor 2025 (2017)
 - Air Force Strategic Master Plan (2015)
 - Marine Corps Vision and Strategy 2025 (2008)
 - Modernizing Learning (2019)
- All of these documents are written in the abstract
 - The purpose of my presentation is to make some of the abstract concepts more concrete
 - I will do my best to translate these concepts to the fields of combat medicine (specifically) and military healthcare (generally)

- Instructional content and methods
 - 21st century competencies
 - Blended instruction
 - Problem-focused learning
 - Need for rapidly-generated content
- Talent management
 - Personalized, adaptive instruction
 - Leverage credentials whenever possible
 - Lifelong learning
 - Informal learning events
- Integrated technology ecosystem
 - Delivery on demand and at the point of need
 - Master learning record for each learner
 - Data analytics and continual process improvement

Big Data + AI = The Future of Training at Scale



- Instructional content and methods
 - Many schoolhouses remain “instructor-centric”
 - Instruction is front-loaded
 - The “crawl, walk, run” approach is extremely inefficient
 - Blended and mobile learning approaches are becoming more common
 - Recognition that downtime can be learning time
 - Provide mobile decision aids to support performance and eliminate the need for memorizing infrequently-used facts
- Talent management
 - Retraining intervals are time-based, rather than need-based
 - Organizational resources are focused primarily on formal learning events
 - Informal and lifelong learning activities are not systematically captured

- Integrated technology ecosystem
 - Many learning technologies remain stove-piped
 - xAPI is becoming increasingly more common, but is still under-utilized
 - Many learner records are still recorded using paper-and-pencil methods
 - Many learner records are maintained in local databases

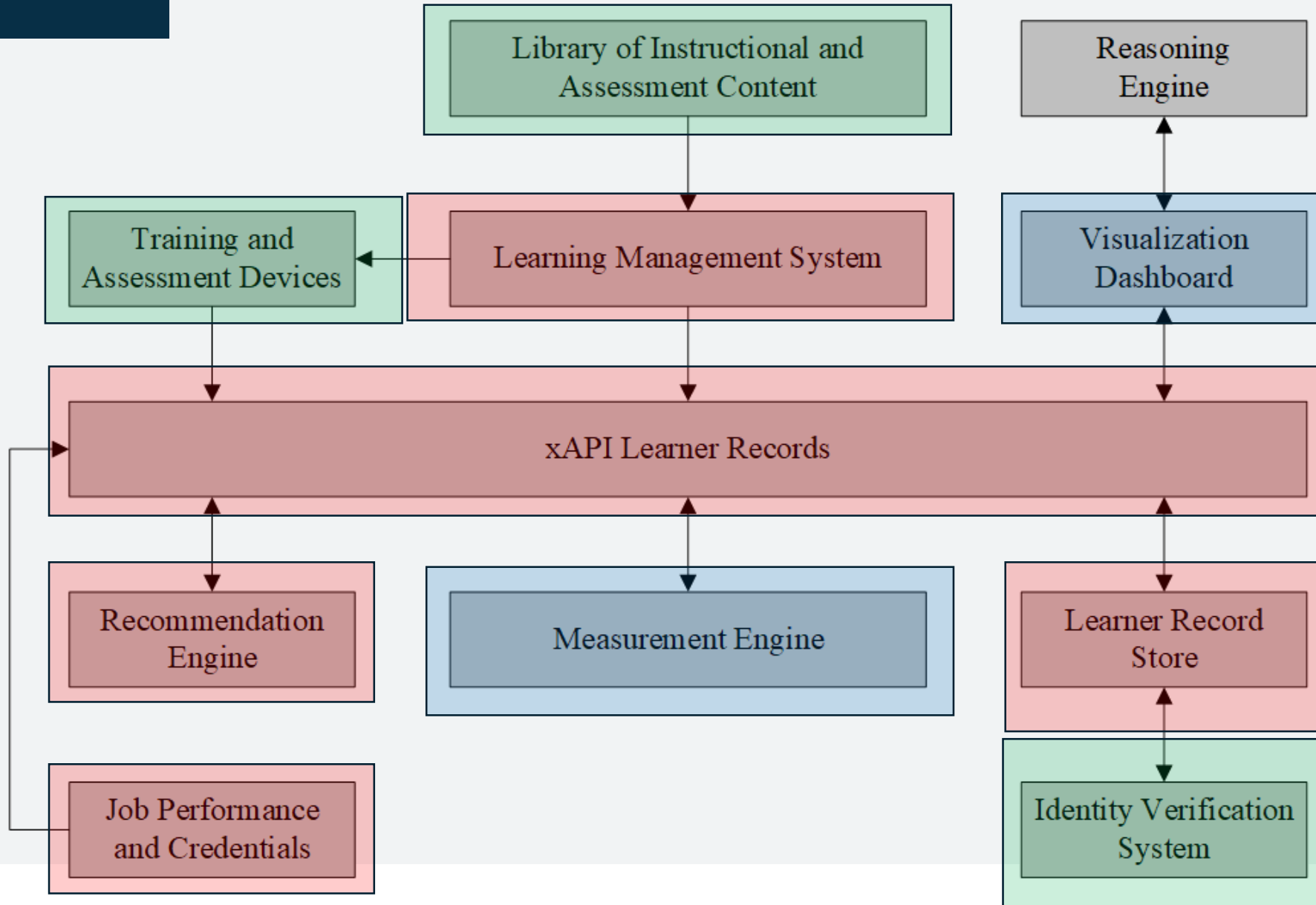
- Instruction should be personalized to maximize learning
 - The effect of intelligent tutoring ($d = .76$) is comparable to that of a live human tutor ($d = .79$)
 - The amount of time spent in deliberate practice is associated with superior levels of performance in medicine ($r = .71$), music ($r = .61$), and sports ($r = .42$)
 - Gamification provides the right level of challenge by adapting to the learners' level of ability ($d = .33$)
- Personalization requires persistent, unobtrusive measurement of learner performance

Gap Analysis – Talent Management

- Most learning occurs outside of discrete, formal training events
 - Between 60-80% of all learning activities are self-initiated, self-directed, and non-linear in format
 - The tendency to engage in self-directed learning activities is positively correlated with access to resources ($r = .30$), job autonomy ($r = .31$), formal organizational support ($r = .38$), and informal support ($r = .30$)
- Skill decay is best modeled as a power function
 - Retrieval practice helps to offset the amount of decay
 - Records of task performance may be available in organizational databases, but are rarely leveraged
- Embrace the concept of “transition periods” across the lifespan
 - Example: A mid-career 68W desires to become a 68C
 - Credentialing tools can be used to map different competency models, and identify only those skills that need to be trained

- The Advanced Distributed Learning (ADL) Initiative has developed tools and knowledge products to address these gaps
 - The Experience API (xAPI) protocol for standardizing learner records
 - Learning Management Systems (LMS) for hosting content
 - Learner Record Stores (LRS) for documenting learner performance
 - Recommendation engines for selecting the next “best” learning event
 - Credentialing systems for linking competency models
 - E-book readers for delivering mobile content
- These technologies are freely-available, but remain under-utilized
- Other technologies are available commercially
 - Measurement engines for generating xAPI records from simulator data
 - Visualization dashboards for analyzing the corpus of “big data”
- The only “missing piece” is an engine for reasoning about (normalizing) the data

Notional System Architecture



Opportunities for Improvement – Immediate

- Embrace unobtrusive performance measurement via the xAPI
 - Use a LMS to deploy interactive multimedia instruction (IMI), knowledge tests, demonstration videos, e-books, and instructor ratings
 - The LMS can also be used to identify simulator scenario content (library files)
- Leverage CAC readers to associate learners with the learning content that they consume and their performance assessments
- Begin to establish a corpus of xAPI learner records, even if it is just local to your organization
- Leverage COTS tools such as Tableau for analyzing / visualizing the data

Opportunities for Improvement – 5 Years

- Develop a corpus of “big data” that encompasses formal, informal, and lifelong learning events
 - Leverage measurement engines that can generate xAPI learner records from team training events
 - Leverage competency data from credentials
 - Invest in technologies that can harvest xAPI learner records from organizational databases (TC3 cards, hospital scheduling and EMR systems)
- Push all xAPI learner records to an enterprise LRS
 - Explore the use of ontologies (SNOMED-CT, ICD-10) for reasoning about the “big data” prior to the widespread adoption of AI

Opportunities for Improvement – 15 Years

- Leverage AI-based tools for personalizing the learning process and conducting training at scale
 - Remediate greatest areas of weakness
 - Reduce training time / maximize learner throughput
 - Reduce training costs
 - Minimize skill decay
 - Achieve proficiency for a related Military Occupational Specialty (MOS)
- Leverage AI-based tools for continuous organizational improvement
 - How can we best provide “ready, relevant learning?”
 - To what extent do simulator fidelity cues actually improve learning-related outcomes?
 - Given the learner’s proficiency on skills A and B, can we estimate their proficiency on skill C?

Summary

- Historically, there has been a tremendous gap between the science and practice of learning
 - Recently, all of the services have begun to re-examine their approaches to training and personnel/talent development
 - Fully realizing these visions will take 15+ years
- Evidence of learning is all around us
 - We just need to know where to look for it
 - The ADL Initiative has invested in numerous tools and knowledge products to record, archive, and analyze learner records
 - xAPI is the “glue” which holds all of these systems together

- Big data + AI = The future of training at scale
 - Immediate opportunities include leveraging ADL-developed technologies to begin recording xAPI-based learning events
 - Near-term opportunities include developing “big data” sets that capture formal, informal, and lifelong learning events and normalize the data
 - Long-term opportunities include leveraging AI-based tools to personalize the learning process, conduct training at scale, and to perform continuous organizational improvement

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