1 Introduction:

Imagine a world, in which services members and professionals engage in lifelong learning while balancing personal and professional obligations, inside and outside the work space because learning is personalized, adaptive, and at their fingertips. This project proposes adaptive teaching, flexible learning, and yet simultaneous student- and teacher-centered education strategy for the 21st century learner. This learning model depends both on a Learner Profile and a Network of Knowledge of educational modules, integrating different teaching and learning tools. Unlike a static book, this combination supports individualized and adaptive learning by recommending the most relevant educational modules for each learner that connects to the learner’s experiences and interest. Similar efforts of blended computer aided learning can be found in the historical view is presented by Weller in [3] and a survey on this topic by Wadhwa in [2]. However we focus this project on DoD’s needs and supply of learners.

Traditional education places all the students through the same topics, at the same time, at the same speed. But such a system leaves some students behind, and fails to challenge others. Traditional education also produces similarly skilled graduates, not enhancing the skills, experiences, abilities, and interests learners already have. For example, the wide gap between the math levels of the officers that take calculus during first quarter at NPS impedes learning for the students that are challenged by the topics, and disengages others since they’ve recently learned the topics. Automated targeting with refresher modules would narrow this gap, as it can remind students how to use $\log$s or fractions, while other students can refresh on a couple of needed topics to validate the course. We propose targeted modules as adaptive learning based on students’ profile. Unlike most established sciences, new research fields such as Network Science hint at non-traditional methods of education that network the modules providing guided learning.

The current project proposes to create a curated Network of Knowledge that supports personalized and adaptive learning to enhances learner’s education, because it builds on each learner’s knowledge and experiences. Much like a GPS taking the driver to a destination, the curation assists the learner in moving through the educational materials. However, the path is not the same for each learner, and there are choices in taking the scenic route to destination based on learner’s preferences. This is achieved through the curation of lesson materials (videos, PPT, PDF, code, exercises and so on) by using the modules’ tags/attributes, rather than following the standard linear or tree-like system of lectures or chapters. CHUNK Learning thus enables the learner to Heuristically discover or learn based on personal interests and background, which we believe will not only enhance the learner’s talents, but will make them a more valuable resource.

How do we achieve it? Imagine a group of children walking into the LEGO store and putting together LEGO creations of different colors and shapes; each child gets a different output based on his/her interest. Similarly, our learner’s interests determine his/her own learning path through the network of knowledge, based either on (a) competencies needed for a course he/she is enrolled in, or (b) on individualized learning goals. Each student benefits differently from the learning experience based on his/her skills and desires to learn, as the suggested learning materials depend on pre-existing knowledge about the learner, and allows the learner to dive deeper in topics if desired. Simultaneously, the network of knowledge builds on the experiences of the students covertly guiding learners through the educational materials, much like Amazon.com [1] provides recommendations for buyers.
2 Your team’s task:

Introduce a methodology for how the Learner Profile and Network of Knowledge are created and linked, in order for each learner to be presented with the most relevant content of the Network of Knowledge:

1. The nodes are the educational modules (each module is stand alone topic based lectures/videos/PPTs such as “Fractions”, “Eigvenctors”, ”Determinants”, etc, including exercises/tests),

2. The edges are of several types capturing correlations between the modules, thus creating layers in the network (for example each layer captures a different relationships such as “same author”, “same application of topic learned”, “same tagged keywords”)


This network of knowledge is a collection of inspirational modules to support 21st century learners that can access information any time, from any where, aided by learning at different speeds and through a variety of modes of delivery and interaction. It allows the learners to self select the breadth and depth of their educational experience to support personal and professional goals. Based on the experience and the learner’s expectation (or previous learning exposure), the network will capture students’ demand for future topics and user experience improvements.

This network of knowledge incorporates learners’ profiles based on individual attributes (i.e., background, skills and learning interests). Learners navigate their own learning path through the network of knowledge guided by feedback from instructors and other learners. Learners can contribute to this network of knowledge by providing guidance to other learners based on their experience. This guidance will come as suggestions that made them successful or impeded their success. This process will provide learning strategies for learners to use and adapt based on personal preferences, rather than reinventing learning strategies. The model should have the capability of covert assessments in order to use machine learning algorithms to improve the model.

Below are attributes that can be used either as tags for nodes or to create connections between the nodes:

• Experience (background in science vs not, visual vs. not, exploratory vs. non)
• Preference (topic based: social networks, vs brain networks, vs Internet)
• Skills (Fortran, C, C++, Python, R, JMP, Matlab, Excel)
• Goals (reinforce something learner knows, expand knowledge, get the gist)
• Education (GED, A.A., A.S., B.A., B.S., M.A., M.S., Ph.D)
• Training (untrained, trained, need practice, refresher)
• Interest (depth, breadth, familiarity, practice, gist)

Exploit existing methodologies and introduce innovative approaches to link the network’s modules. Think outside the box, take a chance and try an out of the ordinary model! “The significant problems we face cannot be solved at the same level of thinking we were when we created them.”– Albert Einstein.

References
