1 Introduction:

Imagine a world, in which service 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 an adaptive teaching, flexible learning, and 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 educational modules, integrating different teaching and learning tools. Unlike a traditional textbook whose content is static, this model supports individualized and adaptive learning by identifying and recommending the relevant educational modules for each learner based on experiences and interests identified in the learner profile. Similar efforts of blended computer aided learning can be found in the historical view presented by Weller in [3] and a survey on this topic by Wadhwa in [2]. However, we focus this project on the DoD’s needs and supply of learners.

Traditional education engages all students with the same topics, at the same time, and at the same speed. Such a system leaves some students behind, and fails to challenge others. It also produces similarly skilled graduates, rather than enhancing the skills, experiences, and abilities learners already have. For example, traditional instruction used in a first quarter NPS calculus class with students displaying a wide gap in their math skills impedes learning for the students that are challenged by the topics, and disengages others who have greater competency. Automated targeting with refresher modules would narrow this gap, as it can remind students how to use logs or fractions, while other students can refresh on only those required topics needed to validate the course. We propose targeted modules as adaptive learning based on students’ profiles. 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 enhance 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. As each learner has a unique profile, the network view of content should not be the same for each learner. The system would provide different choices, based on the learner’s preferences, in how to engage the connected content, all ensuring the learner reached the desired destination. The current methodology is based on curating the 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) individualized learning goals. Each student benefits differently from the available content as the suggested learning materials depend on learners’ pre-existing knowledge, 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 provides recommendations for buyers.
2 Your team’s task:

The current system personalizes the way content is displayed within individual CHUNKs however, there is currently no personalization to the network view of the topics, units, and CHUNKs themselves. All users are provided the same network of knowledge. The goal of this project is to introduce a methodology for how the learner profile and network of knowledge can be linked, providing each learner a personalized view of the network of knowledge providing a the most concise and relevant view of content. It may help to think of the learner either exploring content much like a web search, or refreshing content for a calculus course. In both of these cases, the learners may only need to interact with portions of the whole network of knowledge at one time, and can explore the content in a different order. Consider the following:

1. The nodes are the CHUNKs, 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 or prerequisites 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”)

3. For your simulations, you can access data as education modules using your NPS credentials at [http://www.ChunkLearning.net](http://www.ChunkLearning.net), and we can provide the data for a deeper analysis in Python/Gephi.

The resultant network of knowledge is a collection of educational modules that supports 21st century learners allowing access to information any time, from any where. Each learner’s view may have a different number of nodes and edges depending on the needs identified by the learner profile. The network view should allow learners to self-select the breadth and depth of their educational experience to support personal and professional goals. To support lifelong learners, the personalized network view should also support students’ demand for future topics. The dynamic network of knowledge should adjust to feedback from instructors and other learners. Learners should be able to influence the network by providing feedback and guidance to other learners based on their experiences. This guidance will come as suggestions that supported or impeded their success. 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

