SYSE 590 Integrative Workshop

Why Are We Doing an E-Portfolio?
You May Want to Add Your Thoughts!

Educational Purposes

Distance learning has different challenges than the on-campus environment, and a portfolio of student progress is useful to meet some of these challenges. SYSE 590 provides the student with four credits to participate in an interactive workshop under the guidance of an advisor, spanning the student’s entire educational program thus allowing time to achieve several goals. Student has a record of their work in each class, can add extra material to build on presented topics, and can relate topics to each other to build a broader, yet detailed, vision of the entire educational experience.

Systems Engineering (SYSE) is an acquired behavior to be developed throughout the masters degree program. A student portfolio will document the educational program plan and document that the desired behavioral change is taking place. The portfolio summarizes the courses taken, relates course topics to each other, summarizes discussions with peers and advisors, and documents the student's reflection on the relation of courses and topics to Systems Engineering as a discipline and to the student's career.

Gary’s Thoughts

The systems engineering program uses an e-portfolio course (4 units, broken into 4, 1-unit courses; or 2, 2-unit courses; or 1, 4-unit course) to assist students in their reflective and reflexive learning. The e-portfolio builds on a body of knowledge that recognizes education as the reconstruction or reorganization of experience through connections and continuities of learning experiences. To that end, the e-portfolio provides each student with the requirement to assess their learning, their change in knowledge, and their maturation in the discipline at various times throughout the Master's or PhD experience. The engineering program at Portland State sets up the e-portfolio as a means for each student to work with a primary adviser to help synthesize the student's knowledge through self-reflection and reorganization of ideas, questions, and insights within a constructional framework that the student and adviser customize. This opportunity is the most effective way for students to think and write about their contributions to their continuing education, their life's work, and specifically their current job. We spread out four 1-unit courses intermixed with the 4-unit courses and the 9-month Capstone Project to capture the student's progress and to facilitate maturation.

The e-portfolio course provides three pedagogical assessments. The e-portfolio is first, an assessment instrument for the "outsider" - the student, the instructor, and the employer, family, and friend - which provides the answer to the question, what was learned and how well does that learning integrate with the student's self, life, work, and family. The second value of e-portfolio is to allow the student to organize their thinking in multiple ways as they mature their thoughts with additional coursework, reflection, reflexive thinking, and synthesis with integration. The third value of e-portfolio is the cognitive benefit of drawing more connections between old, new, and synthesized knowledge.
I have used student e-portfolio to gain a better appreciation for how to apply systems thinking and systems engineering. Outside of classroom work, the e-portfolio is an excellent way to try-out identification of questions that need to be answered, problems that require solving, or conflicts that must be resolved. (These are the three kinds of initiants that drive my thinking). The importance of the E-portfolio is to work the student's thinking through the lens of systems engineering using systems thinking as the integrative process. After several attempts, the student and the advisor come to syncopated discussions which then grow in intensity until the student takes over and begins to work on a topic. For me, that topic was for their master's thesis. Each topic was individualized with their personal interests, the requisite systems thinking, the systems engineering approach and use of systems engineering tool, techniques, skills, and knowledge. The students grew their systems engineering language, systems thinking, and prowess through the process. The e-portfolio became their journal for thinking systems and systems engineering. A few of these students (~ 30) continue to write in their journals 10 years on from their graduations and send me excerpts. Often, I incorporate these excellent examples of great thinking into my publications and cite their contribution.

**Systems Engineering Demonstration**

Your educational program is a system, and a difficult one at that!

1. **Learning Both Skills and Abilities:**
   - Skills----- to do something competently that is useable on the job as soon as possible;
   - Abilities-- to manage technical, career and personal challenges unknown now but may arise in future.

2. **Student as Own Test Subject**
   Past habits and viewpoints are harder to evaluate and correct if you have lived with them for 10-20 years.

3. **Education as a Social System**
   The human element in any system often presents the most difficulty. You are now dealing with your own emotions, communication with an instructor, interaction with fellow students, and expectations of a future employer.

   So if you believe that systems engineering is going to help you develop and operate a technical system, why not incorporate some of those concepts in your educational system. The E-Portfolio provides an opportunity to dwell on your educational program and consider what systems engineering tools may make it better. The E-Portfolio is an interim report in the development of your educational system. Example of Using Systems Engineering Concepts

   ConOps, Concept of Operations, represent activities performed to better understand the ‘fuzzy front end’ of a systems engineering project. As we all know, if we can spot a potential mistake at the beginning of our project, we can easily correct. If that mistake manifests itself in the final product, it is very expensive to correct. Not sure why you are doing an E-Portfolio? I hope this document helps! Not sure what format? What do you want to get out of it? Perform a ConOps! Herm would be delighted to further describe his view of ConOps and help you as part of your E-Portfolio development.
Written Journal

Oral communication has its place. What happens when we are asked to communicate using text, grammar and graphics? We become more detached from the ideas giving us perspective to be more analytic, giving us time to formulate inferences and abstractions. Both oral and written sentences involve words, but by writing we follow a structure and can critique what we wrote. These additional factors help us develop a network of meaning based on what we want to communicate and how we are going to do, in a deliberate manner. Ultimately giving us better understanding. Elements of critical thinking are aligned with written language: observation-questioning, express your ideas so others understand, invention, disposition, grasping speculative ideas, organization, and exploration.

Living Document

The E-Portfolio is not for the exclusive consumption of the systems engineering faculty. It is a living instrument for the benefit of the student; a place to:

0. Think,
1. evaluate progress with their education,
2. examine the process of learning and the paths for gaining knowledge,
3. facilitate the discovery, modification and extrapolation of knowns and unknowns,
4. present educational, career and personal achievements.

What Might Go Into Our E-Portfolio?
You Are Encouraged To Modify These Suggestions!

Educational Purposes

Distance learning has different challenges than the on-campus environment, and a portfolio of student progress is useful to meet some of these challenges. The student will consolidate their project experience and knowledge from elective courses with concepts from the systems engineering fundamentals courses. Specifically, students and faculty advisors will engage in:

1. Reviewing and reinforcing systems and critical thinking concepts,
2. Documenting the integration of these concepts with specialty skills, and
3. Demonstrating application of these concepts by means of the project experience.

The portfolio summarizes the courses taken, relates course topics to each other, summarizes discussions with peers and advisors, and documents the student’s reflection on the relation of courses and topics to Systems Engineering as a discipline and to the student’s career. Advisors will provide guidance in the integration of course topics, insight regarding systems engineering concepts, and feedback on portfolio progress.
Educational Program Assessment

The E-Portfolio is a tool, authored and documented by students, to assess the program, specifically:

1. meeting learning objectives;
2. coupling of specialty skills to SYSE concepts;
3. reinforcing SYSE behavior;
4. defining program objectives and progress toward meeting them;
5. discussing program changes in an open forum;
6. planning the portfolio documentation;

(To paraphrase General Eisenhower: Plans are expendable, but planning is essential)

Methods of Evaluation

With guidance from the advisor, the student will define the format, select the topics to be included in E-Portfolio and then reflect on key concepts presented and suggested by their educational experience. The advisor will grade this reflection with special emphasis on the utilization of SYSE concepts.

Four credits generally involve 120-160 hours of student work during one term. The same number of hours should be devoted to developing a portfolio, but in our case, spread over the entire study period rather than one term. Students will be evaluated on an on-going basis, but the grade of Pass/NoPass is posted at end of term in which the student formally registers for SYSE 590. The schedule of classes shown on web page shows one credit of SYSE 590(1) offered toward beginning. Toward the end of masters study period, three terms with one credit each are shown. However, I encourage students to update the e-portfolio on a continuous bases.

Getting Started

Our final product is a portfolio of your experiences, reflections, recommendations, and predictions based on what you learned in class and projects, how it relates to Systems Engineering as a profession, how this learning helps you with your career, and life in general. The more you approach this project as a Systems Engineer, the more you will accomplish two goals:

1. better understanding of what you learned and its application;
2. demonstrates that you have already worked on a systems engineering project, specifically your education system.

As I understand it, Gary asks you to compile a journal for all of his classes. The initial entries in your e-portfolio might start with course journals. Pick a format for organizing the E-Portfolio, which may change over time. Include text, graphics, images, if you wish. An example of an old E-Portfolio is available, which uses graphical Concept Map as its entrance and links to courses, reflections, and projects. That's one approach.

I might suggest that you consider the course journals as 'data'. The entire contents can go into an appendix to the e-portfolio, if you wish. I am only one of many readers, but let's use me as example for
now. You may want to change emphasis in future as you discover other, more important, readers. What would Herm like to see in the body of the e-portfolio, as we get started?

1. Summary of your Educational Experiences
   Especially if your course journal is lengthy

2. Reflection on Educational System
   What are some of the topics that were of particular interest to you and why? Were they hard to understand, but you could see its importance! What topics did were not covered in depth (or you have not yet fully grasped) that you plan to resurrect in future? How did the pieces fit together, thus far? What additional pieces need to be added? Forget about Gary and me for a moment, based on what you have learned thus far, what other topics might you want to investigate, either as entities that are standalone or that augment what you have learned?

3. Broader Implications
   Regardless of our stature as members of a graduate program at a comprehensive university, there is nothing wrong with considering some of your learning as practical and useful tomorrow. Let's hear about that kind? More broadly, what about your career and future life. Have you learned something that is going to impact them? What is it? Why? Either for immediate usefulness on the job or for your next three promotions, what else do you want to learn?

4. Systems Engineering
   Do you recognize its use or its impact in developing the E-Portfolio? Tell us about it?

Suggestions on Portfolio Contents

0. Mechanism for Navigating Content
   a. if a text document, such as a Table of Contents,
   b. possibly, graphics and hypertext links.

1. Study plan and record of courses actually taken:
   a. evaluate progress achieved through this study plan,
   b. assess beneficial changes that occurred.

2. Reflection on coupling of technical specialties and SYSE fundamentals:
   a. connection between the fundamentals learned in past with new, additional systems topics,
   b. relationship of the domain knowledge gained in electives to systems concepts,
   c. use of systems concepts in projects and their impact on the development environment of project.

3. Exemplify systems engineering applied to review of student's educational program:
a. defining the specific objectives of portfolio, given that student, advisor and employer are customers/stakeholders. For example,

1) evidence of competencies  
2) additional work in integration and interface management  
3) assessment of student's program  
4) comparison of student's program to past portfolios

b. measuring how well these objectives were met,

1) faculty advisor interaction  
2) student peer interaction  
3) project advisor interaction  
4) supervisor interaction  
5) outside studies and case studies

c. evaluating (educational) system at the end of program.

April 2018    Thanks, Herm

Dr. Herman Migliore, P.E.  
Associate Dean Emeritus of Engineering  
Director Systems Engineering