



Project-Based Learning & Transportation Curriculum at the Francis Tuttle Technology Center's Engineering Academy

My name is Charles Koutahi. I have been one of [Francis Tuttle Technology Center's](#) Engineering Academy instructors for the past fourteen years. I am pleased to share my experience working on creating and using curriculum in Transportation, Distribution, and Logistics as part of our educational initiative. We were pleased to work with Fran Beauman at the [Northeast Transportation Workforce Center](#) and the national [curriculum](#) building network that she facilitated.

Project Based Learning is a teaching method that encourages students to learn and apply knowledge and skills, by working with hands-on, and program-relevant projects. Through student engagement the PBL method allows the learner to develop a deeper understanding of their required curriculum, as well as the soft skills and team building skills needed for college and career readiness.

Half of the classes in the [pre-engineering academy](#) at our school, Francis Tuttle Technology Center, are based on the curriculum of "[Project Lead The Way](#)." In addition to technical skills, teamwork, interpersonal skills, communication skills, self-management and conflict resolution are practiced daily. The PBL process allows students more opportunities to work in Quadrant "D", the highest level of rigor and relevance, and to become critical thinkers and problem- solvers.

I believe that the biggest challenge instructors have to face is classroom participation. Many of the teachers that I have spoken to would agree that if they could have the students work, then their understanding of the material would increase ten-fold. The trick becomes, how to get the student to buy into the rigor that is needed to succeed in the college of engineering and an engineering career. The level of student participation is far higher in my Aerospace class when the class is working on a project, rather than a typical lecture day.

Project-based assignments require more deliberate action from the students. They have to engage in deeper thought, and take an active, not a passive, role. They have to take personal responsibility for their time management, and conflict resolution. Project-based assignments require more research, critical thinking, and problem solving. Students have to decide how to solve open-ended and complex problems. Seeing the real-life relevance of a project makes the problems worth the effort and extra rigor.

A few years ago, the former aerospace teacher Mrs. Julia Utley and I developed lessons for the Transportation, Distribution, and Logistics K-12 Curriculum Project at the Northeast Transportation Workforce Center, a Federal Highway Administration initiative at the University of Vermont (formerly TransportationCareers.org). These lesson plans were successful in our classrooms, and I have been able to adapt them to fit new changes in our programs. For example, the use of drones vs. blimps in UAV's, and the advancements of satellites, GPS tracking, and navigation. Teachers can find the original lesson plans at the Educator Curriculum site: <http://netwc.net/lesson-plans/>.





Most of the lesson plans that we developed earlier were intended for projects with blimps. They fit perfectly for use with drones and RC planes with only the smallest

modifications. Other lesson plans available on the TDL site seemed tailored for our aero class. For example, [Flight 101](#), along with [Introduction to GPS and GIS](#). In these lessons, the students are introduced to the aviation industry and learn the basic parts and functions of planes and airports, or research what GPS and GIS systems are, and study how they function. They learn about triangulation and target mapping. I added two more TDL lesson plans: [Graphical Linear programming](#), and [X,Y Coordinates: Location Planning](#) to my aero class, to the flight simulator and drone section of my existing curriculum. The students seemed eager to work out the challenges from the lesson plans. I actually use parts of the lessons in my recruitment presentation.

Introduction to GPS and GIS

This module provides an introduction to the basic principles behind GPS and GIS. The students will be tested on their knowledge of GPS and GIS uses and functions, and will also be measured on their ability to use trilateration to find different points on a map.

Grade Level(s): 6-8, 9-10, 11-12, **Subject(s):** Math, Science, CTE

Having our students join in competitions has given them an additional way to connect with potential employers. It has given them a chance to showcase their skills, and to measure themselves against students with the same objectives. It helps students to overcome their fear of taking a chance. These competitions are the students' "work experience," to be added to resumes.

My aero students compete in two contests. Oklahoma State University sponsors the Speedfest Competition, and the Air Force Association, AFA, sponsors the StellarXplorers Competition. Students who year-round are involved with

critical thinking, teamwork, and problem-solving skills, have an advantage over students that have not had the same experience. For example, even though we are a rookie team this year, we are going to the Semi-Finals of the StellarXplorer Competition.

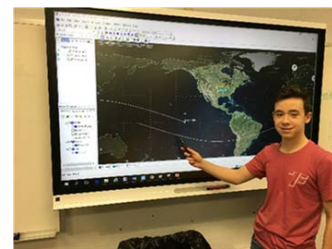
The goal of our engineering academy is to make these students college-ready and career-ready for the aerospace industry. Oklahoma State University and aerospace industries, such as Lockheed, try to attract PBL students by offering scholarships, with a preference for students who have completed the Project Lead The Way curriculum.

There is an aerospace initiative behind these PBL modules. The State of Oklahoma has given many incentives in past years to attract leading businesses in the aviation industry to our state.

*"The **Aerospace Industry Engineer Workforce Tax Credit** is for engineers who choose to go work for Oklahoma companies and for the companies that hire them. Oklahoma is committed to servicing the aerospace industry through incentive programs, education and training, as well as an initiative to recruit and retain a skilled workforce. Individual Tax Credits, Company Tax Credits, and Tuition Tax Credits."* — Oklahoma State Department of Commerce

Our students are building towards a future of employment with aerospace industry companies. The following is a sample of aviation industry companies in Oklahoma who are actively seeking potential employees with the same skill set that project-based learning and TDL promote:

- Lockheed
- Boeing
- Tinker
- Northrop
- Grumman



Transportationcareers.org

A teaching resource with lesson plans and associated resources.

