WIP: College-Wide First Year SeminarBuilding the Foundation for Career Success

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A Fellow of both the ASEE and IEEE, Professor Schrader has served ASEE in myriad technical, regional and institute-level elected leadership positions and committees and has been recognized for her many contributions. She was most honored to receive the Presidential Award for Excellence in Science, Mathematics and Engineering Mentoring from the White House, enhancing participation of individuals who might not otherwise have considered or had access to opportunities in STEM.

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Craig Baudendistel has been teaching for 10 years in the Mechanical Engineering department at Wright State University. He has been heavily involved in first year courses focused on retention. This includes courses in applied mathematics, first-year seminar, programming, and computer aided design. Additionally, he advises 2-3 senior capstone groups per year related to SAE competitions or industry partners like GE Aerospace.

Work in Progress: College-Wide First Year Seminar
Building the Foundation for Career Success

Abstract

This Work in Progress paper was motivated by understanding the unique challenges facing Generation Z (Gen Z) students who now cross the spectra of undergraduate and graduate college degree offerings. Of note is that members of Gen Z experienced the events of September 11, 2001; they lived through a recession and high unemployment; they are familiar with a world at war; their learning and formative years were interrupted by a pandemic; and they are the most racially diverse and technically savvy generation of all.

Research on this generation sets them apart in many ways from previous generations who influenced the development of college courses, program curricula and support infrastructure. Gen Z's unique experiences, needs, loss of learning, and potential creates a clarion call for universities to assess how they are best supported and retained. This study addresses the creation, development and implementation of two pilot First Year Seminar (FYS) courses offered college-wide for engineering and computer science students in the 2024 fall and 2025 spring semesters as a high impact practice for student success.

Results are promising. Student focus groups, faculty focus groups, pre- and post-course surveys and mid-course progress surveys were conducted to provide insight into student development and design effectiveness. Institutional Research at Wright State University produced initial quantitative assessment comparisons during the 2025 spring semester on DFW rates (percentage of students earning a 'D' or an 'F' or withdrawing compared to the total enrollment), persistence, significance testing, and pre- and post-course learning outcomes.

The time is right in the development of this FYS Work in Progress study to solicit feedback from renowned researchers and colleagues through the ASEE Annual Conference and Exposition Work in Progress process to help guide a permanent, rich and impactful experience for a new generation of engineering and computer science scholars.

Introduction

This Work in Progress paper addresses the creation, development and pilot offerings of a potential three credit-hour First Year Seminar (FYS) course as part of a new university core curriculum that begins in fall of 2025. Many first-year seminars focus on academic majors as a common way of grouping students; however, this FYS is multidisciplinary and brings together all undergraduate degree programs in the College of Engineering and Computer Science (CECS) at Wright State University. Initial feedback from the first pilot offering in fall of 2024 influenced both successes and improvements for the second pilot offering in spring of 2025 with permanent FYS offerings anticipated each semester thereafter. The FYS is completed in a student's first year at the university. Exceptions and appropriate core curricular substitutions occur for incoming students who transfer 24 or more credits earned after high school.

High impact practices identified by the American Association of Colleges and Universities include FYS, and statistics indicate that 77 percent of universities and colleges offer first year seminars while 47 percent require FYS enrollment [1], [2], [3]. Studies found that FYS is best

embedded within the general education requirements (university core), and FYS courses in general show increased benefit to all students above those students who do not take a FYS course [2], [3]. Moreover, at-risk students such as first-generation and male students, students of color, and conditionally admitted students saw greater benefits with higher level FYS credit loads. And, when analyzing persistence and progress toward degree all students benefitted the most with three credit-hour FYS courses [3].

It is important to know that students most influenced by current FYS courses fall into the generational category, Gen Z, and are typically described as between ninth grade and 28 years old and born between 1995 and 2010 [4], [5], [6]. They are considered "recession babies," often risk averse and having a scarcity complex. Moreover, COVID-19 and other disruptions in learning such as attrition of knowledge acquisition and disengaged learners set back Gen Z more than any other generation [7], [8]. The direct from high school 2025 college incoming classes were in seventh grade when the pandemic hit. Results included closed schools, cancelled events, introduced online learning and social distancing, and created scarcity and economic hardship. Jobs, income, homes and family were lost. Additional factors include higher mental health challenges that universities and engineering students and colleges have already been addressing for several years [9], [10].

Gen Z can be characterized in ways that are inspiring: loyal, thoughtful, compassionate, responsible and open-minded [4]. These characteristics are common across countries and have been evaluated and found consistent in studies before and after COVID-19 in 2014 and 2021 [4]. In the United States this is the most diverse generation to date. Factors that motivate Gen Z may include: 1) impacting others; 2) making a difference; 3) accomplishment; 4) opportunity for advancement; and 5) understanding why what they spend their time on is important [5]. Every minute of time spent requires a reason. An opportunity for FYS includes building confidence and competence in how to learn and crafting experiences based upon where educators want students to be as they build foundations for career success. It is not simply about what educators want students to know. Changes in both student learning and behaviors due to academic disruption in formative years provide opportunities to apply "learning loss" research strategies as students enter college [11].

A 2017 FYS report at Wright State University using Institutional Research data cited 65 percent of direct from high school first-time students who took a FYS course had higher grade point averages and persisted and graduated at higher levels consistent with national data [12]. This encouraged further study over several years and development of a new university core curriculum that officially begins in the 2025 fall semester. The Faculty Senate and other stakeholders incorporated a three credit-hour FYS requirement into the new core. At the same time, they reevaluated new core impacts and reduced the overall number of new core credit-hours to help students progress toward their degrees faster. This is an important aspect of requiring FYS within university core curricula while accommodating degrees with less flexible options, such as those that are more structured due to specialized accreditation like engineering and computer science. This, in turn, allows more flexibility for undergraduate programs to incorporate microcredentials, minors and certifications known to be of interest to Gen Z students and employers.

In the 2023-2024 academic year Wright State University's CECS department faculty members designed and developed a unified three credit-hour college-wide pilot FYS course focused on

student and professional career success to replace each of their one credit-hour discipline focused FYS courses. This helps free up one credit-hour from individual required program requirements and has the potential of additional credit-hour savings to assist with what can be somewhat restrictive engineering, computer science and technology programs compared to other bachelor degrees. Additionally, CECS faculty members are developing and implementing new program enrichment options for students.

All CECS undergraduate programs committed to the unified 2024 pilot offerings which enrolled 206 students in the fall, one of the largest cohorts from any college involved in the pilot study. Section enrollments were set between 25 and 26 students to allow for personal attention and the ability to make connections with peers, faculty and staff who share similar interests, majors or classes.

These FYS sections were led by a diverse group of eight engaging, inspirational and energetic faculty. Moreover, it is expected that this college-wide shared experience will immerse students in a growing support network of friends and people to assist with questions and provide support throughout their studies. Some CECS programs also come back together again with advanced technical electives, shared minors and certifications, and multidisciplinary senior design and capstone projects at the end of students' undergraduate experiences.

Project Approach

This CECS three credit-hour FYS combines academic success strategies for "learning loss" and Gen Z support with an introduction to the fields of engineering and computer science [6], [11]. It also makes strong connections to career opportunities and professional organizations following sound research strategies to combat learning loss and to answer the Gen Z need for a reason for what they are doing every minute of time. The approach interweaves and provides motivation for all three important aspects of the course, namely

1) Connecting students early to their intended fields of engineering and computer science;
2) Emphasizing academic success strategies and applications in their fields of interest; and
3) Focusing attention on career and professional development over the long-term.

Each of these aspects is described briefly below.

The three credit-hour FYS introduces students to the fields of engineering and computer science and provides an overview of various engineering disciplines, fundamental concepts in computer science, and their real-world applications. Students engage in hands-on projects, collaborative problem-solving activities, applications in engineering, and discussions on current technological advancements.

This seminar emphasizes academic success strategies, including effective study habits, time management, and goal setting [13]. Students learn techniques for active learning, critical thinking, and leveraging campus, college and departmental resources such as tutoring centers, libraries, academic advising and department specific "Help Rooms." The course also covers strategies for balancing academic workload with personal well-being, including stress management and maintaining a healthy lifestyle.

Additionally, students explore career opportunities, ethical considerations in engineering and technology with a mini research topic using AI, and the importance of teamwork and communication skills in professional settings. Guest lectures from practitioners offer insights into practical aspects and future trends in these dynamic fields. By the end of the course, students have a foundational understanding of engineering and computer science, preparing them for further study and continuing professional development.

Another innovation is to provide hands-on experiments and research projects. A diverse group of eight accomplished faculty members were recruited to lead this course in its initial implementation. This offering was considered an honor for faculty members known for their effective teaching and student engagement. Of note, in the end of course surveys from the first pilot offering each one of these faculty members was highly praised for helping individual students move forward decisively regardless of their impression of course content. This indicates an important aspect of FYS courses. Put your best faculty there (see Acknowledgments).

Each faculty member offers a breakout session and potential mini research project to entice students to choose their topic, such as:

- 3D Printing and Prototyping;
- CMOS, Bits, Bool, and Digital Design;
- Applications of a Scanning Electron Microscope;
- Analyzing Data with Python Libraries;
- Do's and Don'ts of Computing;
- Aircraft Performance;
- Sensors and Microcontrollers: The Arduino Uno; and
- Modeling and Simulation in War and Peace.

Students select four mini research projects and choose two of these as the subject of an E-Portfolio/Poster team project. These selections are called Hot Swaps, which refer to replacing or adding computer system components without stopping, shutting down or rebooting [14]. Essentially, they happen in real time. Students report that these ideas inspire them and open their eyes to what they could pursue and accomplish. Hot Swaps also help connect students, faculty members and others with like-minded interests and CECS and community support infrastructure.

Table 1 below provides a brief outline of subjects and assignments to give readers an in-depth understanding of how this course infiltrates college interests with student success in ways that are engaging to engineering and computer science students.

Table 1. Course Activity Outline

Week	Subject	Assignments
Week 1	Course Intro/Syllabus Communications Platforms (Pilot, Discord, Email, E-Portfolio) What is Engineering? Professional Organizations	Pre-Course Survey Scavenger Hunt
Week 2	Student Success Resources Major Exploration Goals/Organization/Time Management Cybersecurity and Password Management	Advising Activity 1 Wix E-Portfolio Setup
Week 3	Engineering Tactics to Project Management for Individuals Team Management Engineering Design Process	Semester Planning Activity Weekly Outline (self-care, course work, work/life) My Academic Success Plan
Week 4	Wellbeing Ethics in Engineering, AI and Large Language Models (LLMs)	Mini Research Topic Using AI
Week 5	Basics of CAD in Solidworks for Everyone	E-Portfolio Project Wellbeing Plan
Week 6	Critical Thinking Data Variation and Experiments	In Class Experiment Homework
Week 7	Student Success Strategies: Data Visualization and Processing	Homework
Week 8	Perspectives Modeling and Simulation Logs/Exponentials	Advising Activity 2
Week 9	Finacial Wellness Modeling and Simulation	Homework
Week 10	Grit and Resiliency Choose 1 of 8 Breakout Sessions	Mini Research Project
Week 11	Academic Advising Choose 1 of 8 Breakout Sessions	Mini Research Project
Week 12	Career Services Choose 1 of 8 Breakout Sessions	Advising Activity 3 Mini Research Project
Week 13	Communication and Public Speaking Choose 1 of 8 Breakout Sessions	Mini Research Project
Week 14	E-Portfolio Engineering Group Project Managment	
Week 15	Working Session Peer Review Session Presentation Session	Post-Course Survey
Week 16	E-Portfolio/Poster Team Project	

Results and Future Implications

Individual CECS programs are incorporating new course assessments into their overall ABET and Higher Learning Commission (HLC) course and program assessment plans. The new FYS course learning outcomes below are assessed through various assignments, quizzes and projects, which could well result in an interesting longitudinal plan.

Course Learning Outcomes
As a result of their learning experience, students successfully completing the FYS can:

1) Reflect on responsibilities and set goals to enhance confidence and competence in adjusting to change, confronting challenges, managing stress, and improving wellbeing;
2) Apply relevant skills and access resources to learn and communicate strategically; and

3) Develop an academic plan to attain academic and professional goals consistent with personal interests.

Results are being collected in the FYS pilot offerings and analyzed on a yearly basis in the fall semesters. Results contribute to course and program assessment for regional and specialized accreditation as appropriate. Specialized accreditation also benefits by focusing on the three following ABET student outcomes:

ABET Student Outcomes

1) An ability to communicate effectively with a range of audiences;
2) An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts; and
3) An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives.

Of interest is that these three outcomes are also assessed through senior design or capstone projects at the end of students' programs which may lead to rich assessment over the undergraduate course of study. The initial pilot offering identified but did not assess these outcomes. Accredited programs will determine how best to integrate these ideas into their assessment plans as the FYS course moves forward on a permanent basis in fall of 2025.

Wright State Institutional Research conducted analyses of student persistence for every college involved in 2024 fall pilot FYS courses. CECS students enrolled in the first pilot FYS course demonstrated an increase of persistence of over ten percent than that of students who did not enroll in a FYS course. Persistence is measured by students registered in one academic semester continuing in the following academic semester.

Significance testing was performed on fall 2024 FYS pilot results for completion rate (no significant difference found), semester grade point average (GPA) (significant difference found with $p < 0.05$), and fall to spring persistence (significant difference found with $p < 0.05$). Additional results will be evaluated for spring to fall 2025. Additionally, LMS analysis is expected over the coming year.

Pre- and post-course surveys provide insight into student development and design effectiveness and are administered to all FYS offerings at the university with Institutional Research collecting and analyzing data for consistency following IRB approval. These surveys in addition to assessments addressed at the college level cover four areas of interest: 1) knowledge and skills; 2) connections to support; 3) navigation and resources; and 4) confidence and values as illustrated in Table 2. Wilcoxon Signed Rank Obtained Values associated with pre- and post-course surveys are indicated with starred values: * $p < 0.05$; ** $p < 0.01$; and *** $p < 0.00$ (two – tailed).

Table 2. Pre- and Post-Course Survey Questions

Knowledge and Skills	Connections to Support	Navigation and Resources	Confidence and Values
I know how to be academically successful in college***	I have connections with my peers on campus***	I know how to explore careers I am interested in***	I find value in learning about perspectives different from my own
I know how to overcome challenges in college***	I have connections with my professors***	I know how to use academic support services on campus (tutoring, writing center, etc.)***	I feel confident communicating with others***
I know how to manage my stress**	I feel connected to Wright State University	I know how to find information about a topic and determine its accuracy***	I am confident in the major I chose
I know how to manage my wellbeing	I feel connected to the academic college my major is in	I know how to synthesize information together to make an informed opinion***	I am confident in my future career plan
I know how to study**			
I know how to balance my time			

These results allow for a better understanding of how the new CECS FYS compares within the university for the shared course learning outcome statements described above. As an example, early results for pre- and post- surveys reported in March 2025 show CECS was among the top colleges in outcomes assessment results in Institutional Research findings presented to researchers and faculty members. These initial results allow additional, detailed information to be considered for fall 2025 FYS offerings.

Faculty focus group reports and methods for the fall pilot offering were initially shared with faculty participants and administrators in February and March of 2025. Qualitative comments from the survey were included. Results indicate that the following intended outcomes were met: 1) career exploration; 2) exposure to university resources; and 3) providing a welcoming classroom environment. Revisions in the E-Portfolio and final project occurred due to feedback provided, and additions remain under consideration.

Student focus groups (with food) indicate success in the following: 1) a connection to peers; 2) a connection to faculty; and 3) career preparation. This is good news for CECS students. Additional results for CECS students indicate an appreciation for networking and career enhancement, how to get involved, the importance of advising and asking for help, and studying techniques. Well-being and privacy were of concern to many students and some faculty, and these components have been reviewed and removed from CECS FYS in future semesters as a result.

Additional analysis, understanding and improvement actions will be incorporated before the first permanent offering of this seminar under the new core curriculum. Similarly, CECS faculty members are reviewing and finalizing results from student focus groups, student reflections and mid-term progress surveys for both semesters of the FYS offerings. Already the spring semester innovative use of peer tutors is showing promise, and agreement has been reached to incorporate peer tutors in future FYS offerings.

The inaugural semester teaching eight concurrent student sections of the CECS First Year Seminar in Fall 2024 had many organizational challenges, mostly related to managing and collating course content contributed by all eight instructors. There were simply too many deliverables and too much content split across student success and college content. One unfortunate manifestation of this in the fall semester of 2024 was a higher-than-expected rate of disengagement as the semester progressed, with some students seemingly losing motivation to complete assignments. This experience is not unfamiliar to those researchers who study Gen Z and learning loss, where the reason for what students spend their time on is important. Adjustments were made during the fall semester pilot to address these issues, changes were adapted for the spring semester pilot offering, and early indicators suggest improvements were made.

Progress quiz results from October 4, 2024 of the inaugural FYS offering are also promising. Overall students early on felt that the class met their goals, answered their questions, and helped guide them in their choice of major.

A primary objective in the 2025 spring semester offering has been streamlining and condensing course content into a more accessible and concise set of materials. The number of out-of-class assignments has been deliberately reduced to approximately one per week, with in-class exercises and attendance forming the bulk of the remaining course grade. This change has been particularly welcome and helpful in sections with high numbers of international students.

The additional wealth of information and opportunity to share Work in Progress results with respected colleagues in related disciplines sets the stage for an effective and influential CECS FYS beginning on day one of Wright State University's new core curriculum in fall of 2025.

Acknowledgments

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