

Fostering Leaders in Technology Entrepreneurship (FLiTE): S-STEM Program Fourth Year Progress

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Scott Rowe is an Assistant Professor in Western Carolina University's School of Engineering + Technology with an entrepreneurship background that he hopes to disseminate among aspiring undergraduates. This includes successful company startup and incubation in conjunction with the University of Colorado Boulder. Ideally this expertise expands academic impact and propels Western Carolina University students into roles within their own companies.

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Western Carolina University (WCU) hosts an engineering entrepreneurship program funded by S-STEM at the National Science Foundation. The six year initiative, titled “Fostering Leaders in Technology Entrepreneurship,” has completed its fourth year of operation. The program continues in its mission to cultivate an entrepreneurial mindset among a cohort of 29 engineering and technology students. Program activities for the 2025 calendar year included presentations at a pitch competition, scholar completion of a certificate course in business startup, and the integration of scholar’s products in their Project-Based Learning curriculum. Success in these activities, which includes functional prototypes and a patent, have set the stage for student activities outside the host university (WCU). This paper summarizes considerations for undergraduate entrepreneurship that extends beyond an academic environment. A structure for future activities is described.

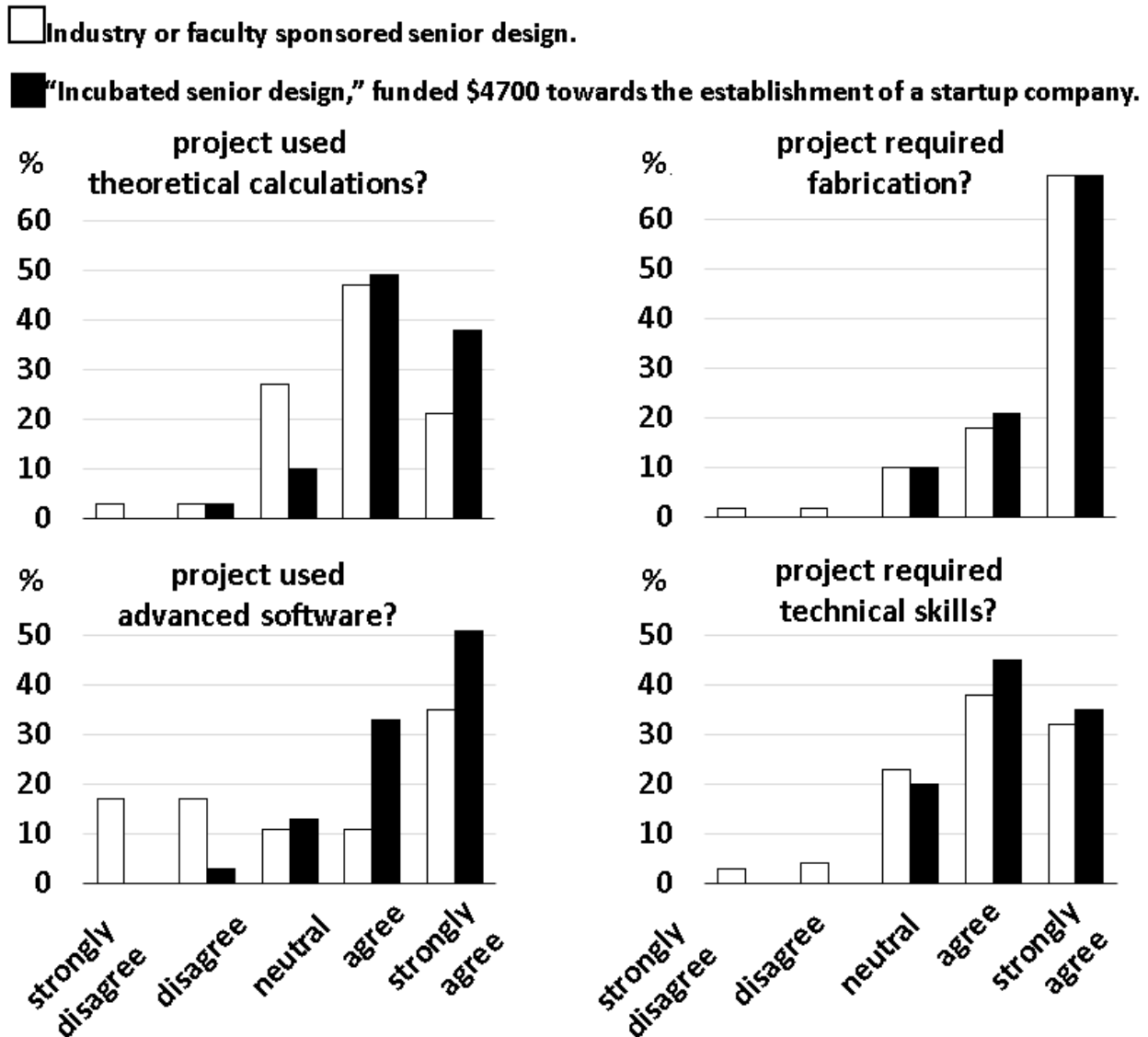
Introduction

The NSF FLiTE (Fostering Leaders in Technology Entrepreneurship) Grant at Western Carolina University currently hosts 29 engineering students whose direct costs (tuition and fees) are paid by the National Science Foundation (NSF). Beyond curricular pursuits, these scholars participate in business commercialization activities around technology concepts. Ideally FLiTE cultivates business talent among these engineering students, skills that can buoy economic prospects in a region where gross domestic product has historically grown at half the national average (1). Here we report progress towards this goal, which includes details of FLiTE’s implementation and pending activities.

Business and engineering training can likely combine to enhance the undergraduate educational experience (2-4). As example, deeper class engagement was observed among Rowan University engineering students who won monies to pursue commercial concepts in capstone senior design (2). As shown in Figure 1, Rowan University’s entrepreneurship engineers were more likely to apply fabrication, theory, software, and technical skills in their projects classwork. Rowan University provided \$4,700 per student project (2025 dollars). Similarly, FLiTE pays \$5000 to engineering projects by Western Carolina University scholars in their Senior year capstone class. However, as shown in Figure 2, the structure of FLiTE defers engineering projects. Specifically, FLiTE starts in freshmen year when students lack foundational engineering competencies. In preparation for funded projects underclass FLiTE scholars have met weekly for the last four years. Within these meets students pursued preparative business exercises while they concurrently learned engineering from their formal coursework. Weekly meets have included a business certificate from the First Flight Incubator (5), a business certificate from the principal of TenBiz consulting (6), and internal pitch competitions. Based on this training FLiTE scholars now routinely podium place at Western Carolina University’s pitch competition, which is hosted internally by the College of Business. However, of the initial ten students onboarded to FLiTE, only 30% (3 students) have proceeded to senior year in a timely fashion. NSF now funds these

students in their senior projects coursework. FLiTE's first seniors have built functional prototypes, received \$10,000 in added Western Carolina University funds for project execution, and drafted a patent for filing.

Figure 1: Summary results from Marchese et. al. 2001 on capstone senior engineering design at Rowan University and the effect of entrepreneurship.



FLiTE Scholars

Western Carolina University FLiTE scholars are students with financial need who favorably answered a set of essay questions (7) as judged by the five program directors. Scholars must be Pell Grant eligible with an SAI lower than 6300. Relative to their peers, in many cases these students likely received less preparation for college. However, FLiTE's retention rate (67%) is comparable to the host institution (69%); the School of Engineering and Technology at Western Carolina University. To assist scholars their GPA is closely monitored and at-risk students are invited to weekly assistance hours hosted by the FLiTE program director. Scholars have also been

encouraged to assist each other (“vertically integrate”). An independent evaluation suggests that older participants are mentoring younger participants (7, 8). Involvement in business pursuits may be a motivator itself, and a prior engineering entrepreneurship program enhanced student retention by 19% relative to pupils uninvolved in commercial activities (9).

Current Status and Future Plans

To assess the success of FLiTE’s weekly scholarship meets a custom 35 question survey was recently administered to FLiTE recipients and the general engineering population (Fall 2025). Results strongly suggest that FLiTE students are less risk averse and more willing to pursue business despite uncertainty (publication pending) than other engineering students. Figure 3 shows an example response, which suggests that FLiTE student proclivity towards business is 10% higher than their engineering peers. Historically, FLiTE has sought to instill an entrepreneurial and growth mindset, a goal that may have been achieved.

To ensure future program success, especially as scholars receive capstone NSF funds for projects, FLiTE has adopted an “incubator” model. As shown in Figure 4, each FLiTE team ideally harbors four students, where each student leads a given commercialization aim. Students are guided by and accountable to assigned FLiTE directors, directors who coordinate the advancement of their business concept with their classwork. Current student deliverables build small proposals for external funding (\$5,000-50,000, Venturewell E-Team, NCidea MICRO, Energy I-Corps). Essential activities include:

- 1) patent drafting, which enables scholar disclosures to the public.
- 2) interviews with customers, suppliers, and potential partners (market research).
- 3) prototyping, especially in student projects classes with NSF funding.
- 4) pitches, preferably outside of the student institution (Western Carolina University).

To assist student efforts multiple current and former executive officers have visited and shared ideas with FLiTE scholars, which includes personnel from Cumming’s Diesel Engines, Green Brothers Well Drilling, Dare Vegan Cheese, Phantom CNC Systems, and Junia Holdings. Outside speakers have assisted business ideation among the scholars, which buttresses limited student life-experience and business acumen. Additionally, in 2025 all current FLiTE students and directors have signed nondisclosure agreements to protect future business intellectual property. These steps reflect FLiTE’s new operational regime as a student business incubator. Overall, this approach seeks impact beyond the university and into the wider community.

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Figure 2: FLITE. For 4 years FLITE has awarded scholarships to engineering freshmen to fund their college education through to graduation. Each cohort of freshmen joins a multidisciplinary teams of mechanical engineering, electrical engineering, and engineering technology students. Each team can contain a mix of underclassmen & upperclassmen. The teams and their concepts evolve and potentially pivot year-over-year on a path towards graduation and technology readiness.

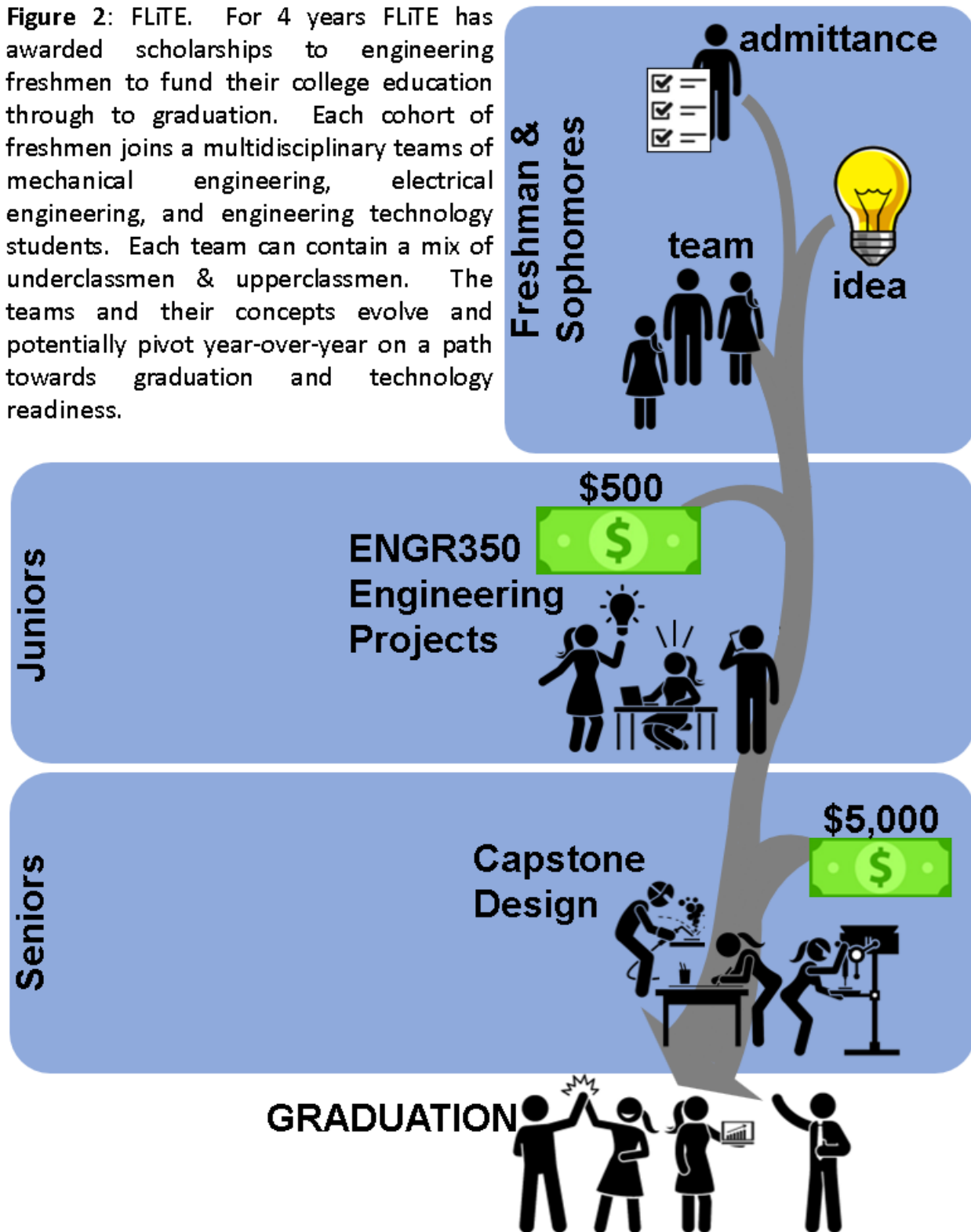


Figure 3: Example result from the recent 35 question survey to FLITE and non-FLITE Engineering Students at Western Carolina University.

“You are employed as an engineer in industry, working 45-50 hours per week and making \$90,000 annually. You’re aware of a business opportunity with a 35% chance of success. It will consume \$10,000 of your earnings yearly and require work on the weekends (25 hours extra each week). Are you willing to invest in this opportunity for five years to potentially start your own business?”

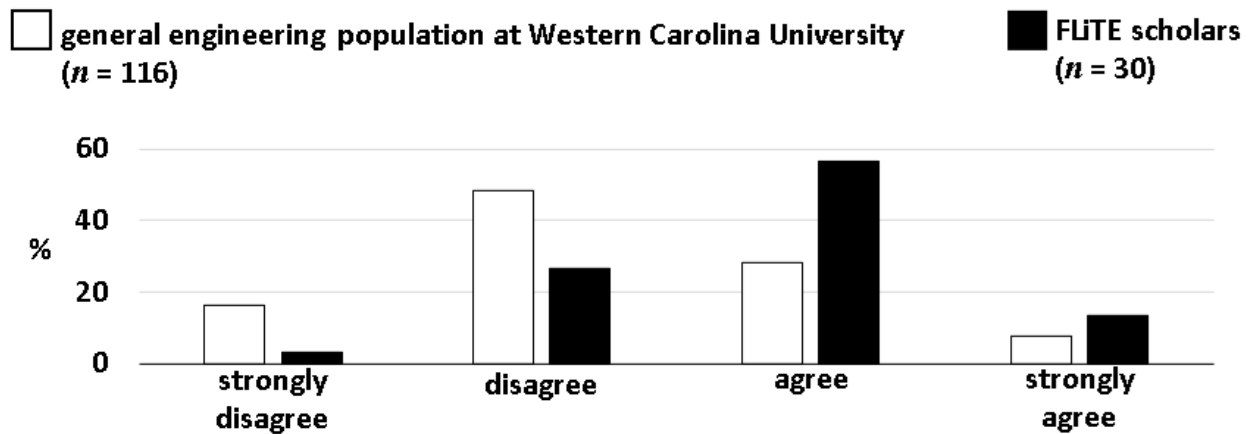
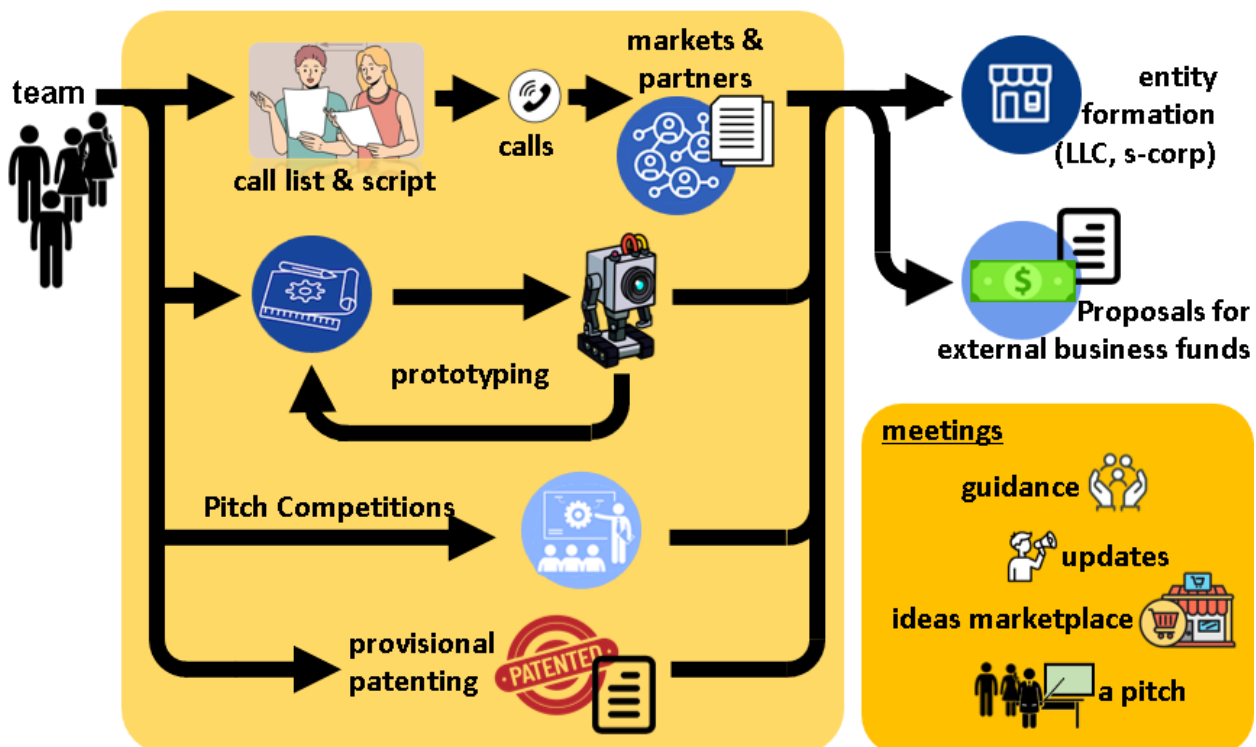


Figure 4: Current “incubator” goals of the FLITE program and the structure of weekly meets. Meets start with guidance to each scholar team from assigned program directors. All teams then meet en masse for updates, feedback, and a pitch from one current team. In the “ideas marketplace” teams can dissolve and coalesce.



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